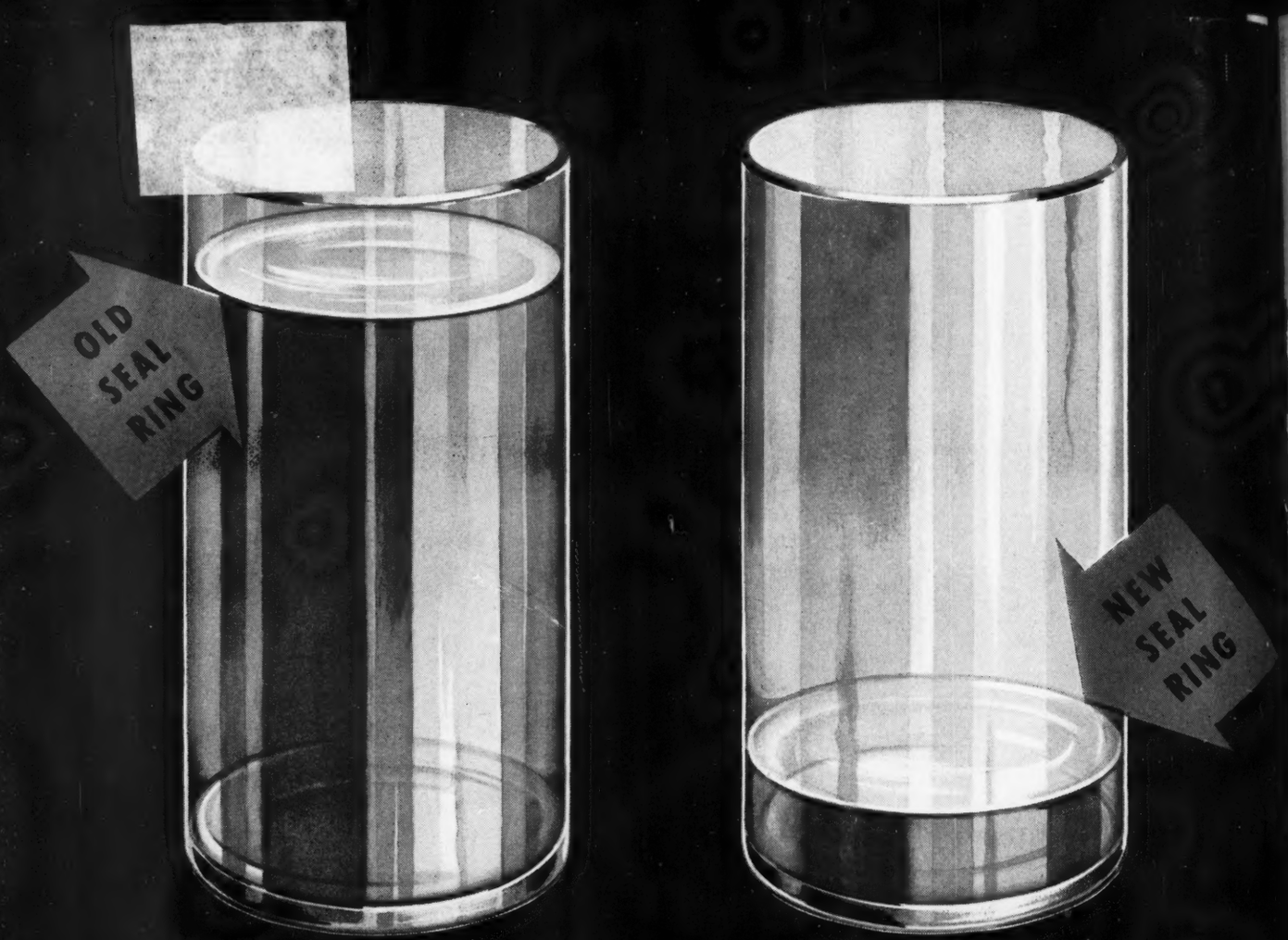
ENGINEERING AND MINING JOURNAL

September, 1946

Loading holes for shatter-cut drift round, Flin Flon mine, northern Manitoba

U.S. Must Plan for Future Mineral Supply—Page 53



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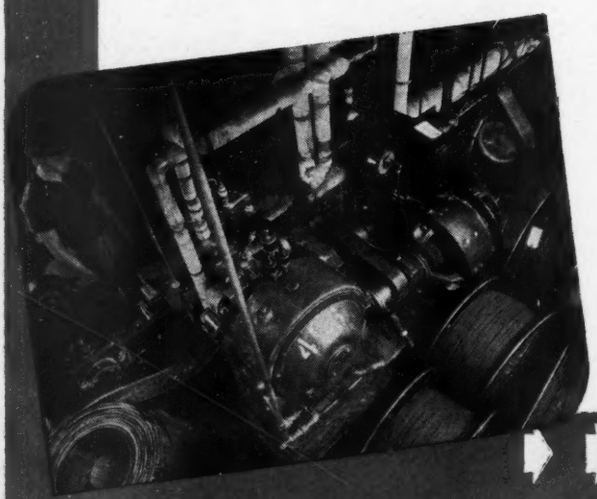

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ENGINEERING AND MINING JOURNAL

SEPTEMBER, 1946

Persecution of Vanadium Producers

AGAIN the Department of Justice, which seems to have decided that all large operations are criminal, has struck at the mining industry. This time the victims whose reputations the Department seeks to smear are the two principal domestic vanadium producers, United States Vanadium Corp. and affiliates, and Vanadium Corporation of America (E&MJ, July, p. 94). The defendants are charged with monopolistic maneuvering to drive small operators out of business.

The vanadium industry is essentially a small one, whose importance is based on its strategical necessity rather than size. It is a spasmodic industry, swinging widely with fluctuations in the business cycle, and at a peak in the tooling-up stage of wartime. Currently it is in a postwar slump for lack of markets, the USV plant at Rifle, Colo., being the only domestic producer.

During the war both defendant companies devoted themselves whole-heartedly to Government service. USV enlarged its own facilities for Government use and built and operated a new plant for the Government at Durango, Colo. This is known as "the cheapest million-dollar plant in existence," as, by dint of careful use of available materials, it cost only a little over $100,000. Vanadium Corporation of America built and operated a new plant at Monticello, Utah, for the Government. Both companies are proud of their wartime record of self-sacrificing service for only nominal fees. The greatly expanded requirements for war were produced at the same price vanadium brought in the depression year, 1932.

These operations also played a vital part in the production of uranium. Because their part in these proceedings is still secret, these companies are prevented from speaking out in their own defense. Nevertheless, EM&J is convinced that many of the activities alleged to be monopolistic were simply part of this secret Government program. This puts the Justice Department in the position of "hitting below the belt," a status which seems to have become its favorite attitude.

Far from conspiring to eliminate small producers, the defendant companies have done much to enable small producers to exist. When USV entered the district in 1926, mining had been nonexistent since the domestic radium industry collapsed half a decade previously. Rehabilitation and enlargement of the operations at Rifle took both courage and hard work. When the mine was apparently depleted in 1932, it took these same qualities, plus applied science and considerable investment, to develop the newer reserves and efficiency on which the operation rests today. Similar qualities were displayed when USV built a plant at Uravan in 1935 and when Vanadium Corporation of America rehabilitated and enlarged its plant at Naturita in 1939. A typical vanadium plant costs at least a million dollars. Also, capital strength is required to survive the severe "lows" in vanadium's fluctuating market. Had these strong companies not set up these treatment plants, and carried them through thick and thin, no small operator in the region would have a market at all. No small vanadium operation, so far as known, has ever survived hard times.

There is no monopoly in vanadium. Vanadium Corporation of America and USV have been competitors in the vanadium market for many years. Since Vanadium Corporation of America resumed domestic mine production in 1939, these two companies have competed in the Colorado-Utah area with particular vigor in both acquisition of claims and purchase of ore. Also, there is certainly no approach to a monopoly of vanadium resources, even by the two companies together. The sandstone deposits of the Southwest are very extensive, and variously owned. Also there are large reserves, as yet uneconomic, in the Phosphoria formation of the Northwest and in the Adirondack magnetites. The Department of the Interior estimates known commercial reserves at only 7 years' supply at the 1935-39 rate of use, but submarginal reserves as exceeding 100 years' supply. However, it will take strong companies, extensive research and efficient plants to develop these submarginal reserves to the best advantage. Our Southwestern commercial reserves of today were considered submarginal in 1925, and it required these factors to make them commercial.

During the war USV expanded its interests in tungsten and is now a large domestic factor in that business. Beyond its mining activities,

the company has built Government treatment plants as well as its own, and engaged in research that contributes considerably toward making the little fellow's products marketable.

However, USV, large as it looms in domestic vanadium and tungsten, is a minor activity to the parent company, Union Carbide & Carbon Corporation. If this company is to be embarrassed with anti-trust persecution because of its mining activity, a likely course will be to withdraw its capital, know-how, and research facilities from mining. Who will be the loser from such a course except the American people and the small operators for whom these larger organizations develop and provide a market?

It is well known that the concealed deposits on whose discovery and development our domestic mineral industry's future must depend cannot be developed by the little fellow. Great sums spent in geophysical and geological research and risked in large-scale programs are necessary. To encourage such enterprise is in the best interests of the little fellow, as he is likely to find a logical part in the development, whereas without the big fellow's capital, know-how, and research, he will have nothing at all. This persecution of large companies which are able and willing to assume the risks of modern mineral development is the most anti-conservational policy a Government agency could pursue and is seriously damaging to the public interest.

We say again that it is time for a Congressional overhaul of anti-trust legislation. The present course of "justice" is definitely toward treating all business as criminal that is dominated by a few large units. It makes no distinction between domination gained by practices in restraint of trade and domination achieved through service and efficiency, or growing out of the localized occurrence of certain mineral resources.

A Check-Up on Safety Is Always in Order

IF THE ANNUAL AWARDS of safety trophies over many years and the excellence of the records for which the awards were made have any significance at all they mean that a high degree of mine safety can be achieved by the company that earnestly strives in that direction and has the cooperation of its men. Though no one in the industry is likely to assume from these accomplishments that the millennium has been reached in safety work, it will be beneficial all around if each operator will engage in a little self-examination and ask how the results he is getting from his own program measure alongside those that have received honorable mention. After all, there is the possibility that the latter are mountain peaks jutting out above a plain of mediocrity. There is always the chance that a company will do no more than locally exerted pressures demand.

To achieve real safety in a mine, more is required than electric cap lamps, hard-boiled hats, safety shoes, gloves, and goggles. Good light permits better inspection of the back, lessens stumbling and gives surer movements of hand and body. Safety clothing protects the person to a certain extent when minor mishaps occur. But all these have their limits of usefulness. They do not make an unsafe stoping method safe, or lessen the hazard of the long vertical climb in the steep raise or shaft that is unbroken by platforms and staggering of ladders. Nor do they make riding the skip bail something to be recommended, or lengthen the life of a well-worn hoist rope that properly should be discarded.

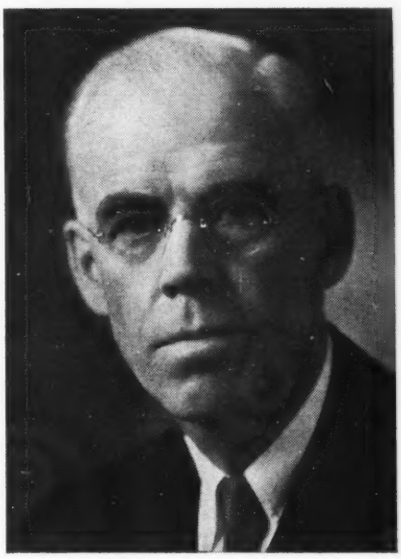
Routine safety programs can easily become perfunctory unless the management burns with a zeal for safety. Men should not be pressed for production to the extent that they risk their lives, even though this increases their bonuses on payday. Greater care and consideration will be reflected in lessened compensation. Education in safety must be pressed from the top management down with the utmost sincerity, and, once a code of safety practice has been drawn, it should be rigidly enforced.

In many cases, bonuses or prizes to crews or divisions for good safety records are extremely helpful in securing cooperation. Usually the results are out of all proportion to the cost. Moreover, if a prize system involves some benefits to the families of workers, such as movie tickets or coupons exchangeable for pressure cookers, roller skates, or baseball mitts, important allies of safe practice will be enlisted. The constancy of their reminders will be as valuable as the strength of the pressures exerted. However, if bonuses or prizes are employed, care must be taken to prevent the system from discouraging the reporting of accidents.

Safety pays. Although the primary reason for adopting a safety program is certainly the priority of lives and limbs over profit, when all costs, direct and indirect, are considered, the management which neglects safety overlooks an opportunity to profit; likewise to exercise a favorable influence on the acquisition of efficient personnel and its loyalty after it has been acquired.

Future Mineral Needs Call for International Trade

Industry Is Urged to Sponsor Realistic National Policy



C. K. LEITH

EXPANDING INDUSTRY and the demands of war have made sad inroads into our mineral resources. Deposits which formerly seemed large enough to last indefinitely into the future are beginning to look small when viewed in the perspective of modern demand. Discovery, of course, will prolong the life of many mineral reserves, but the record shows that the rate of discovery has been definitely falling for a long time. The pertinent facts of depletion are graphically summarized in the recent estimates of the U. S. Geological Survey and the Bureau of Mines.

The natural consequence of depletion, coupled with growing demand, is more imports. It also happens that many of the "new" minerals required by modern technology are not known to exist in adquate amounts in this country, and such demand adds to the variety of imports. In this category are the raw materials of the atomic bomb.

The problem of future mineral supply posed by these new conditions calls for coordinated planning both by industry and Government in domestic and foreign fields, and for war and peace.

Wide Range of Views

Unfortunately, however, the problem is being obscured and planning has been delayed by controversy. One group emphasizes the opportunity to foster international trade, to balance exchange, to accept minerals in repayment of loans, to remove tariffs and other trade barriers, and in general to implement the Atlantic Charter in regard to access to resources and freedom of trade among the nations. Some even go so far as to advocate holding back mineral production in this country in the interest of conservation.

On the other hand, some members of the domestic mineral industry seem to regard planning in the foreign field as a threat to domestic development and production. They question the degree of depletion and the rate of decline of discovery. They are confident that the driving power of the industry will find means to maintain for a long time much the same degree of self-sufficiency that the United States has enjoyed in the past, if given tax relief, good prices, and premiums for marginal ores. They charge the advocates of increasing foreign trade with lack of concern for the prosperity of the domestic industry and they particularly resent the suggestion of "lock-up" conservation which would hold back domestic production. In general, they deplore the increasing participation of Government in industry affairs.

Overstatement and charges of improper motives have appeared on both sides of the argument. The final answer is not in sight, but, from long association with the problem, I feel strongly that the perspective can and should be clarified.

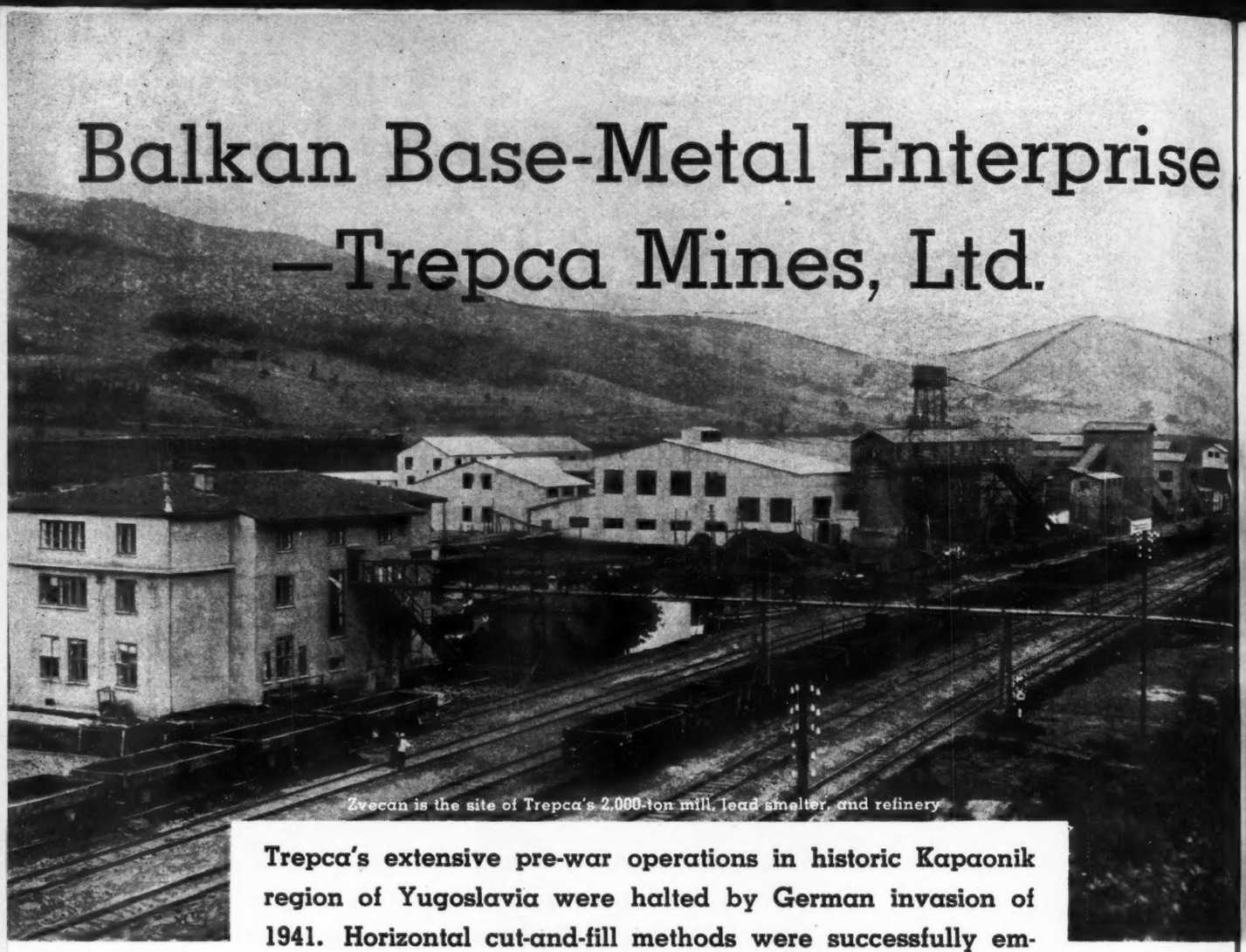
The central fact, as I see it, is that, regardless of degree, our dependence on foreign mineral supplies is growing. Coupled with this fact is the steady spread of public controls over minerals in nearly all the countries of the globe. This encroaching control is a natural result of the growing recognition of the vital importance of minerals to national welfare, either in peace or war. Mineral supply is no longer merely a question of open-market purchase or commercial control of foreign reserves. At almost every turn there are governmental agreements to be negotiated. The current discussion of control of the raw materials of the atomic bomb dramatizes a problem which, in some degree, extends through other minerals. The field of private initiative and ordinary commercial trade in minerals is being narrowed day by day, regardless of the ideals set up in the Atlantic Charter. Though every effort should be made to preserve as much private trade as possible, the tide of public control will not be stemmed by free-trade slogans. The United States itself has not yet started to revise its 22 mineral tariffs. In fact, the "Buy American" provision in the recent stockpile act adds to the barriers against imports.

Government Participation

Mineral trade will require an ever greater variety of international understandings and agreements to supplement private effort. They might be bilateral. They might start with the English-speaking peoples, who already control nearly three-quarters of the world's minerals, either commercially or politically, and also control the sea. They might be multilateral, under the auspices of a United Nations, as part of the effort to implement the Atlantic Charter. Negotiations of a piecemeal and spasmodic kind are already under way and will soon be intensified under the eco-

(*Continued on page* 101)

Balkan Base-Metal Enterprise —Trepca Mines, Ltd.



Zvecan is the site of Trepca's 2,000-ton mill, lead smelter, and refinery

Trepca's extensive pre-war operations in historic Kapaonik region of Yugoslavia were halted by German invasion of 1941. Horizontal cut-and-fill methods were successfully employed in mining replacement-type sulphide orebodies in limestone, having substantial lead, zinc, silver, and iron values

MINING in the part of the Balkans which now comprises Yugoslavia has been carried on from the Roman era. Records show that working of certain areas for gold was in progress during the time of the Emperor Augustus, and according to the evidence of Plinius the Elder (died in 79) as much as 50 pounds of gold were extracted daily. Silver mines also existed in Dalmatia, in the northeastern part of the Balkan Peninsula, and in the mining district of Kapaonik, which included Trepca and Janjevo.

The duration and extent of the exploitation of these minerals by the Romans is by no means certain, but it appears to cease with the Slav invasions and rebellions which weakened the Roman Empire during the Byzantine period. The period between the Slav conquest and the Middle Ages when the Ragusans started to settle in the Servian mining districts remains obscure.

The resumption of mining dates back to the thirteenth century and continues to the Turkish conquest of the fifteenth century. The efficient exploitation of the mines stopped at different periods under Turkish rule; they were completely abandoned in the seventeenth century.

Area Mined by Romans

In the Kapaonik area, remains of extensive old workings and mining plants offer evidence of the great activity at one time prevailing in this area, and among the local populace fantastic tales are still told about the "Romans" who worked in the interior of the mountain, the great wealth of lost cities, and the luxury of their inhabitants.

The entire Kapaonik mountain range, with its silver mines, was known to Venetian travelers of the sixteenth and seventeenth centuries, who in their journeys by land from Ragusa to Constantinople had to pass near its southern flank, by the name of "La Montagna del 'Argento.'" Even in 1806, the Turkish attendants pointed out to Pougneville the Kapaonik mountain, which could be seen in the distance, referring to it as the "Gumesh-Dagh" (Silver Mountain).

Subsequent to the seventeenth century there are practically no records of any further work being done in this area until the operations of Selection Trust, Ltd., in 1925. In that year a party of engineers proceeded to Jugoslavia to investigate certain mineral areas brought to the notice of Selection Trust. These areas were in southern Yugoslavia, near the town of Kosovska Mitrovitza, on the River Ibar, some 180 miles south of Belgrade, to which they are connected by rail and road. The areas are in semi-mountainous country with altitudes up to 2,000 meters, steep, rugged valleys, and

some plains. Streams are torrential during the winter and low in the summer. The climate may be particularly severe during the winter months.

The most successful operation undertaken by the company was that of finding, developing and bringing to production the orebody at Stan Trg, some 5 miles east of Kos Nitrovitza, at an altitude of 760 to 1,000 meters above sea level.

Orebody Is of Replacement Type

In 1926 the orebody was discovered as the result of reopening an old adit and the investigation of a former open cut working associated with many large pits. Work was actively carried out on the orebody by diamond drilling and the driving of further adits lower down on the hillside. Late in 1927 Trepca Mines, Ltd., was formed to exploit and develop further the orebody, which at that time had developed some 500,000 tons of lead-zinc sulphide ore. Since that time operations proceeded on an enlarged scale until the property was overrun during the Italian-German advance into Yugoslavia in April, 1941.

The Stan Trg orebody is a replacement deposit in limestone and consists mainly of a mixture of sulphides, galena, blende, pyrite, and pyrrhotite, with some gangue. Its dominant formation, called the Stan Trg series, is made up of a complex of schists and phyllites, quartzites, and crystalline limestone which has been compressed and folded. The rocks are believed to be of Paleozoic age. The beds are not fossiliferous and have not been correlated with other areas in the Balkans. Original sediments consist of a considerable thickness of shales, grits, and of argillaceous sandstones, containing bands of impure limestones and at least one thick band of pure limestone. The pure limestone is the ore-bearing formation, which locally is stratigraphically overlain by quartzite and phyllite. Intrusive into the schist series are numerous small masses and dikes of dolerite, which, however, bears no mineralization of importance. The schist-limestone series after folding was covered with tuffs and sediments of Miocene age.

A much younger series covering the old topography consists of lithic and crystal tuffs interbedded with shales, mudstones, and conglomerates. The lithic tuffs include pyroclastic agglomerates, vent breccias, and conglomerates. Tuffs were affected only by the feeble later stages of regional folding and thus underwent only slight tilting and late tensional adjustments to cause jointing and fissuring.

The vulcanism of this period contributed an important andesitic sequence of intrusives immediately preceding and also contemporaneous with the deposition of the tuffs series. Ore deposition has direct genetic association with an intrusive pipe of dacite and breccia belonging to this phase of activity.

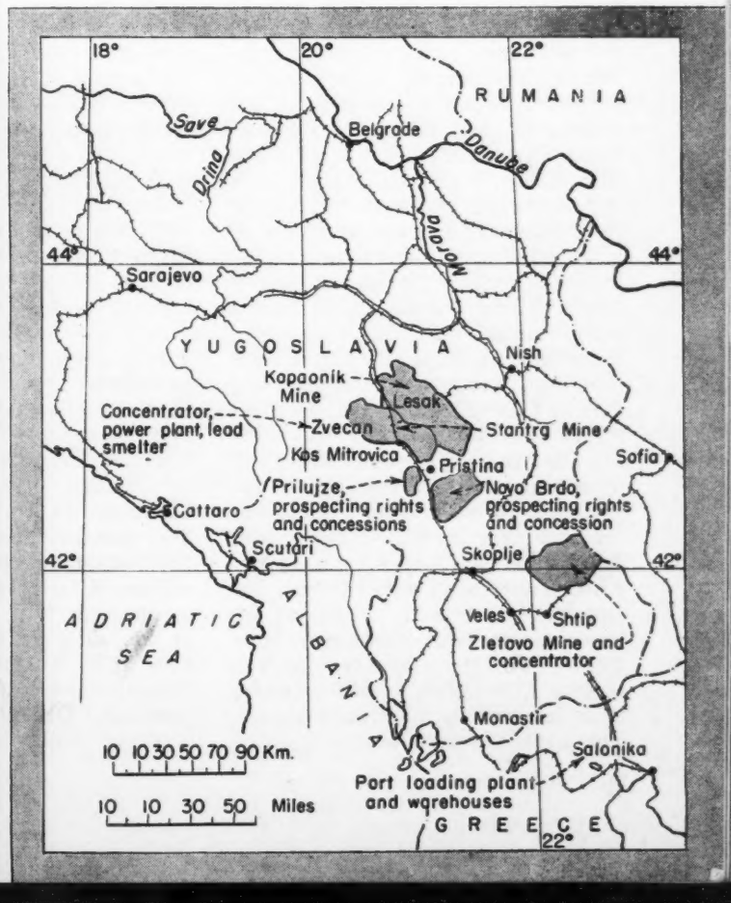
The folding of the series, which

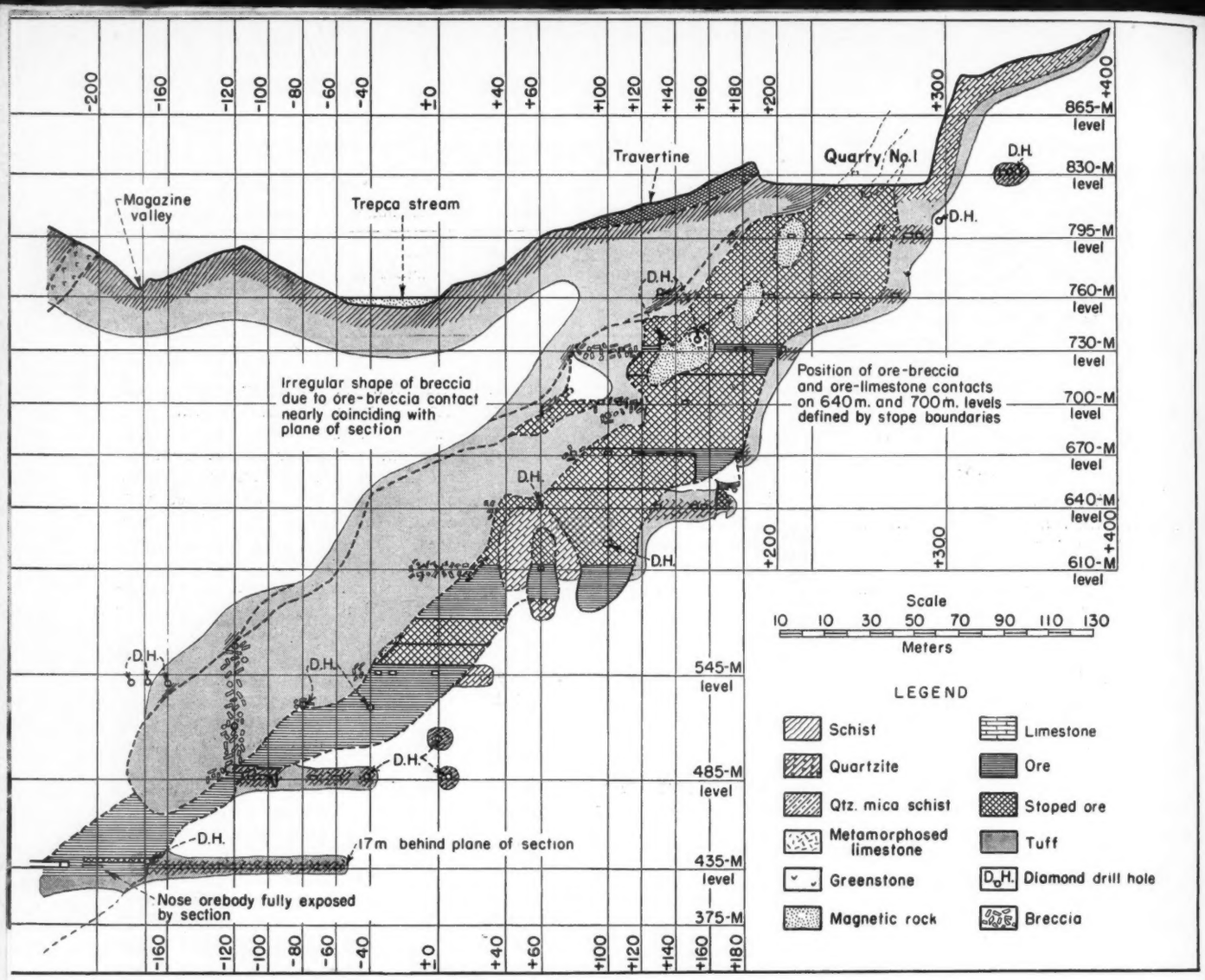
Constituents of Stan Trg Orebody

Ore Minerals			Gangue Minerals		
Sulphides	Sulpho Salts	Oxides	Carbonates	Oxides	Silicates
Galena	Jamesonite	Magnetite	Calcite	Quartz	Actinolite
Blende	Arsenopyrite		Rhodochrosite		Garnet
Pyrite			Siderite		Amphiboles
Pyrrhotite			Dolomite		

ORE from the Stan Trg mine is hoisted in cars to the 770-meter level and delivered through the adit in the left foreground to storage bins.

MINERAL AREAS exploited and developed by Trepca Mines, Ltd., are shown. The Stan Trg mine has been the company's most successful undertaking.





LONGITUDINAL SKETCH along the center line of the Stan Trg mine. The orebody is developed down to the 435-meter level.

was pre-mineral, has resulted in the formation of an apparent anticlinal structure, the axis of which strikes northwest-southeast and pitches 40 deg. northwesterly beneath the covering schists. Thus in any horizontal section through the series the schist contact shows the customary triangular shape of a pitching anticline, the apex situated to the northwest, with the northeastern and southwestern schist contacts dipping in opposite directions at 60 to 70 deg. northeast and southwest. Along the axis of this structure, between the schist and the limestone, has been intruded the andesite-breccia pipe, by means of which genetically associated mineralizing solutions reached the favorable limestone. The upper surface of the pipe, which normally consists of an andesite core with a jacket of breccia, composed of angular fragments of the country rocks, schists, quartzites, and limestones, is in contact with broken schist. The lower surface makes a clean contact with the limestone. The contact between the limestone and the breccia forms the path of the ore solutions which have replaced the adjacent limestone.

Ore Favors Structural Apex

A vertical cross-section through the structure described shows the flanking schists dipping in opposite directions away from the apex; and the apex filled with the breccia pipe gives the limestone contact the shape of a wide, somewhat-rounded capital "M." The top apexes of the letter are the most favorable for ore deposition and for the deposition of the largest orebodies, known at the mine as the northeast and southwest nose orebodies, respectively. These nose orebodies tail off along the breccia or schist contact on both sides of the breccia pipe, creating deposits from 4,000 to 6,000 square meters in area, when viewed in a horizontal plane. Other smaller but still important orebodies occur at varying distances from the breccia along both the northeast and southwest schist contacts.

Continuity has been proved throughout the vertical range of 400 meters. Post-mineral faulting is of negligible effect, being confined to minor slips.

An accompanying table shows the major mineral constituents of the Stan Trg orebody.

Only a shallow gossan zone occurs near the surface; the limestone and orebody were covered until recent geological times by the tuff and schist series. The change from the gossan to the sulphide ore occurs abruptly, with very little secondary enrichment.

The orebody consists of massive sulphides with varying proportions of the main ore minerals without special segregation or banding. In this formation the sulphides are accompanied by arsenopyrite and jamesonite deposited in the many cavities and vugs of the orebody. The galena is argentiferous. Minor quantities

of bismuth and chalcopyrite, with a trace of gold, complete the constituents of the sulphide group.

Rhombohedral carbonates form a minor proportion of the orebody. Rhodochrosite banded with marmatite is often found near the footwall. Carbonates tend to decrease in depth with an increase in quartz, and actinolite and iron-aluminum amphiboles increase, resulting from metamorphic changes in limestone during ore deposition. These features, in association with the general spread of pyrrhotite throughout the orebody, indicate transition to hypothermal conditions of origin.

In depth zinc decreases, lead remains constant or increases, and the silver-to-lead ratio increases. In the outlying orebodies zinc content is persisting to greater depths.

In 1940 the ore reserves totaled 4,848,000 tons averaging 8.6 percent lead and 3.8 percent zinc.

Tonnage Extraction by Levels

	1935–1936	1936–1937	1937–1938	1938–1939	1939–1940
Above 610	515,681	412,751	339,543	217,215	91,605
610–545	97,679	223,757	248,865	206,992	209,529
545–485	.....	18,955	78,075	164,236	250,976
485–435	.....	.....	4,183	44,424	159,197
Total	613,360	655,463	670666	632,867	711,307

Ore Milled

Year	Dry Metric Tons	Pb %	Zn %	Oz. Ag/ Ton	Fe %	Insol. %
1930–31	256,549	12.60	7.60	....	.....	.....
1931–32	397,963	9.67	8.83	3.65	30.50	8.50
1932–33	535,869	8.91	8.66	3.00	30.90	9.40
1933–34	589,081	8.85	8.56	2.96	30.30	9.90
1934–35	597,188	9.06	8.62	2.92	29.81	10.00
1935–36	588,594	8.93	7.74	3.10	31.32	11.72
1936–37	638,729	9.12	6.08	3.29	32.76	12.83
1937–38	655,892	9.08	5.97	3.41	33.30	12.12
1938–39	616,073	8.73	4.91	3.59	33.94	11.67
1939–40	698,760	8.63	3.68	3.94	35.04	11.92

Three Stages of Development

The vertical extent of the orebody so far developed and exploited ranges from the 830-meter level to the 435-meter level. All references to levels are taken from the sea level as datum.

Development and exploitation have proceeded in three distinct stages. (1) By adits above the 760-meter level. (2) By vertical shaft from the 760-610 meter level. (3) By internal inclined shaft below the 610-meter level.

Levels were initially driven 30 meters apart, but an interval of 60 meters was later successfully adopted on the basis of increased stoping experience. The evolution of level development has followed the gradual increase of knowledge gained concerning the deposit, helped to a large extent by the use of diamond drills to establish geological contacts.

The 760-meter level is that of the valley bottom at Stan Trg. Here are situated the ropeway terminal to the mill, the compressor plant, and shops.

The 610-meter level is the point at which the deep dewatering and supply adit intersects the mine workings.

The nose orebodies were originally developed by driving the adit direct to the ore-breccia contact, which was then followed, and crosscuts were put out from it at 20-meter intervals, thus dividing the orebody into readily workable blocks. Later, however, during the development of the levels below the 610, when fuller knowledge of contacts was available from previous systematic diamond drilling, this breccia contact drift was replaced by a main drift farther in the footwall, crosscuts at 20-meter intervals being extended on both sides of the drive to the limits of the ore. By placing the main drive in this position, more efficient servicing and tramming were obtained.

Outlying orebodies along the schist contacts are developed by drives parallel to the general trend of the contacts; crosscuts are run out, and diamond drilling is done at regular intervals. Diamond drilling is also used extensively in the search for orebodies occurring in the footwall limestone; when found, these orebodies are developed.

All ore opened is sampled by channel cuts along both sides of drives and crosscuts. Samples are cut by hand with hammer and moil and are taken in one-meter lengths. All samples are entered on special assay plans, from which ore reserves are calculated. Check sampling of crosscuts is a regular feature of this work.

The normal drive or crosscut is 2.2x2.2 meters in cross-section, with a grade of 0.5 percent. Where volume of traffic necessitates double track, the drifts are opened out to 3.2 meters wide. Openings stand well in the limestone and generally in the ore, and only occasionally require timber support. In the schist and breccia, however, timbering is usually needed.

Preparations for stoping include raise connections from level to level for ventilation, ore and fill passes, and ore chutes to the stopes.

Cavities Cause Water Flows

The mine makes an average of about 1,000 gallons of water per minute, but large cavities are known to exist in the vicinity of the southwest schist contact which have given temporary flows of up to 20,000 g.p.m. When developing new levels, every care is taken in pushing drives forward in this ground, pilot holes being kept in advance and to the flanks of the drifting.

Below the adit level the water is handled by electric centrifugal pumps with a total capacity of 7,500 g.p.m. Sinking of the pump shaft and construction of the pump chambers are carried on in the comparatively impervious flanking schists, and before developing a new level the whole of the pumping installation is in place and ready to work, and is isolated from the ore and water-bearing limestone by large concrete dams with watertight doors. Three main pumping shafts, in-

clined at 40 deg., carry rising and suction piping.

Stoping is carried on mostly by the horizontal cut-and-fill method. Square set and fill is used where the weakness of any particular section warrants.

On completion of development, the orebody is silled out 5 meters above rail level to the full extent of the orebody, leaving supporting pillars of 10 meters by 10 meters, which are recovered at the end of operations. Chutes are so placed as to give one chute per 400 sq.m. of ore, cutting down the length of movement of ore in the stopes to any particular chute. These chutes are placed away from main tramming roads so as to avoid traffic congestion, and are usually double compartments built of 20x20 cm. timber framing, one compartment containing pipes and ladderway or left bare for the introduction of supplies to the stopes, the other lined with 10 cm. poles sawed lengthwise with the round surface to the ore. Just prior to evacuation, experiments were being conducted with concrete chutes, which, though promising, were inconclusive.

Concrete Floor Laid

On completion of the silling-out slice, a concrete floor 15 cm. thick and reinforced with strands of old tramway rope is laid over the entire silled-out area. This floor is designed to give the necessary strength to allow for the final step in the extraction, with square sets, of the next block of ore beneath.

In the opening of a normal slice, two chutes near the fill raise are connected by a slot (2 to 3 meters high), from which breaking proceeds outwards. The ore is broken by horizontal holes, drilled in three rows to a depth of 1.5 to 2.0 meters. Drilling is done by Ingersoll-Rand 39 and Holman Silver Dart machines, equipped with line oilers, using $\frac{7}{8}$-in. hexagonal steel, and run wet. A miner and helper together operate the machine, and under normal conditions drill 20 meters per shift. The miner is also responsible, under the stope boss, for the safety of his working area. The first $1\frac{1}{2}$ to 2 hours of his shift are spent in barring down and scaling and in preparation for drilling. The explosive used, which is fired by fuse and a No. 8 blasting cap, is of the ammonium nitrate class, equal to 40 percent blasting gelatin. This explosive, which is manufactured in Jugoslavia, has proved a safe and insensitive type, well suited to the particular needs of the mine.

All chutes are so placed that a high percentage of the ore can be shoveled direct. Where this is not possible, wheelbarrows are used. Usually no sorting is practised in the stopes, but large blocks of barren limestone are left on the stope floor. Experiments have been carried out with scraper loading but have not proved cheaper than the existing manual method.

Apart from the few square-set stopes, little timbering is needed in normal extraction. In places of local weakness, props with head and footboards and wedged chocks of square white pine are in use. Timber is mostly recovered after extraction of the next slice.

All fill, other than development waste used as fill, is quarried on surface. The quarries are situated in schist and schist breccia, which, besides breaking easily, run well when dry, are easy to scrape and distribute in the stopes, and pack down to form an excellent stope floor. During prolonged wet weather, however, trouble is experienced in handling this material.

At the quarry, fill is scraped to a central pass by two 25-hp. electric scrapers, where it is loaded into 1.5-meter capacity Granby cars. The cars, running on a self-acting incline of 14 deg., deliver the fill to centrally placed fill passes which connect directly with the stopes. With some of the outlying stopes, however, it is necessary to have a car transfer of fill on the level above. Fill passes are driven with a minimum inclination of 5 deg. and are kept empty when not in use to obviate packing.

Scrapers Distribute Fill

Before filling a stope slice, the old floor is swept clean of all mineral fines, as these have been found to be particularly rich in galena. Fill was formerly distributed entirely by $7\frac{1}{2}$- and 10-hp. air hoists using scrapers of the box type, but in the larger main nose orebody stopes, electric scrapers were installed. The fill is leveled to within 50 to 75 cm. of the back, leaving just enough room for the start of the next slice.

Extra fill passes are put through to the stopes as the distance from the level above gets smaller, thus giving a better control of the remaining bridge of ground.

Square-setting with fill is used in weak orebodies, and also for removing the last 5 to 10 meters of each level.

Tramming of ore from the chutes on all levels other than the bottom level is normally by hand, using 1-ton, all-round, tipping steel cars. On the lowest levels electric locomotive haulage is employed, with trains of rigid cars of 1.25 tons' capacity, using a tipple for discharge.

Shaft Has No Headframe

Owing to the contour of the ground, the vertical shaft is not supplied with the conventional headframe. Instead, the top of the shaft itself acts as the headframe, with loading and off-loading carried out from an adit 30 meters below the shaft collar. The whole output of the mine is handled at this horizon, which is situated at the 770-meter horizon.

Ore from the 760- to the 610-meter level, the latter being the level of the drainage adit and bottom of the vertical shaft, is dropped to the 610-meter level through a series of ore passes and hoisted by cage in $2\frac{1}{2}$-ton V-bottom side-discharge cars. Ore from areas between the 610-meter level and the 435-meter level is hoisted to the 610 through a 40-deg. inclined internal shaft which follows the average pitch of the nose orebodies. The ore-hoisting incline is serviced by two 3-ton self-dumping skips, emptying into an ore pocket from which $2\frac{1}{2}$-ton cars are loaded and run to the vertical shaft by gravity. Empty cars are elevated by creeper chain from the shaft and returned to the loading point.

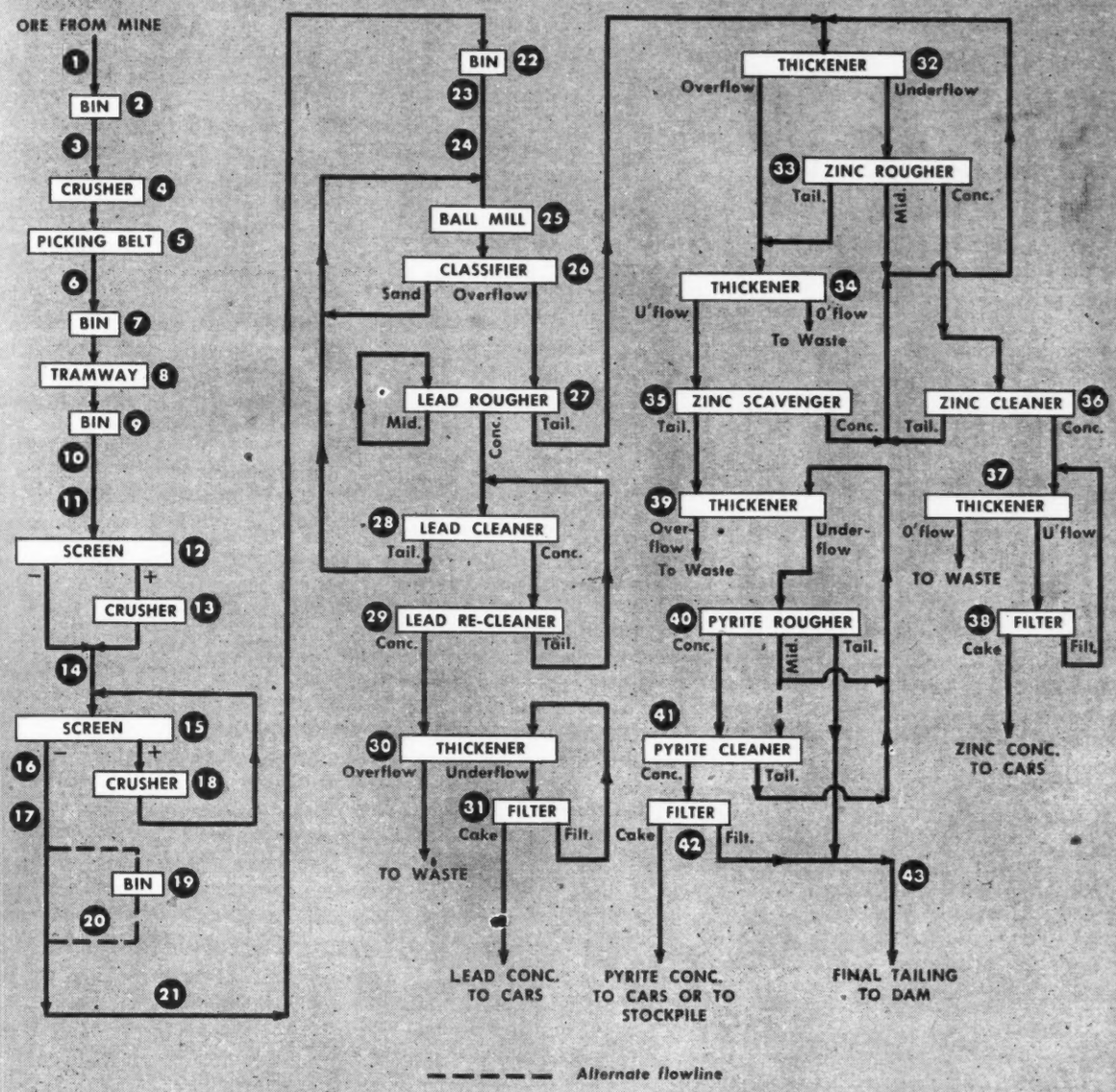
An accompanying table (p. 57) gives the extraction in tons from the various levels during the last five years of operation.

All ore arriving at the 770-meter adit level is run out of the mine by gravity and dumped into a 1,000-ton storage bin. Empty cars are elevated and returned to the shaft by gravity.

From the 1,000-ton storage bin the ore is trammed by diesel locomotive to the ropeway terminal bins, where it is crushed and passes to the ropeway storage bins over a picking belt, where some 3,000 tons of waste per month is removed.

All machinery at the mine is electrically driven. Compressed air, at 90 lb. per sq. in. at the com-

ZVECAN CONCENTRATOR—TREPCA MINES, LTD.



LEGEND

1. Mine cars, 600-mm. gage, 30 cu.ft.
2. Dumping pocket, 400-ton.
3. Rail grizzly, 3-in. aperture.
4. Blake jaw crusher, 24x15-in., to 3-in. ring, fed by Ross No. 50 chain feeder.
5. Waste picking belt, 36-in., with magnet.
6. Shuttle conveyor, 24-in.
7. Tramway loading bin, 850-ton.
8. Bleichert aerial tramway, 21,704 ft. long, 100 tons per hour, 11½-cu.ft. buckets, speed, 490 ft. per min.
9. Tramway terminal bins, 1,300 tons.
10. Robins apron feeder, 62-in. centers, 24-in. steel flights.
11. Belt conveyor, 24-in., with magnet.
12. Hum-mer vibrating screen, 4x6-ft., apertures, ⅜x1½ in.
13. Symons standard cone crusher, 5½-ft.; capacity, 150 tons per hour to ⅜ in.
14. Belt conveyor, 24-in.
15. Two Symons vibrating screens, 4x10-ft., apertures, ¼ in. square.
16. Belt conveyor with Weightometer, Merrick Model E.
17. Automatic chain and bucket sampler for heads sample, 7½ tons per day.
18. Symons short-head cone crusher, 4-ft.; capacity 150 tons per hour to ¼ in.
19. Mill reserve storage bin, 1,300-ton.
20. Traveling apron feeder, rubber belt.
21. Belt conveyor, 24-in.
22. Ball-mill feed bins, three 450-ton tanks.
23. Schaffer Poidometers, three No. 20.
24. Three belt conveyors.
25. Three Hardinge conical ball mills: Nos. 1 and 2, 8x4-ft., 200-hp., 500 tons per day; No. 3, 8x5-ft., 225 hp., 720 tons per day.
26. Dorr duplex classifiers, three, 8 ft.x26 ft. 8 in.
27. Denver Sub-A, three 16-cell, 21-in., flotation machines.
28. Denver Sub-A lead cleaner.
29. Denver Sub-A lead re-cleaner.
30. Dorr thickener, 40-ft.
31. Oliver filter, 8x12-ft.
32. Dorr thickeners, two 30-ft.
33. Denver Sub-A, two 16-cell, 21-in. zinc roughers.
34. Dorr traction thickener, 70-ft.
35. Denver Sub-A, one 16-cell, 21-in. zinc scavenger.
36. Denver Sub-A, one 8-cell, 21-in. zinc cleaner.
37. Dorr thickener, 40-ft.
38. Oliver filter, 8x12-ft.
39. Dorr thickener, 30-ft.
40. Denver Sub-A, one 16-cell, 21-in. pyrite rougher.
41. Forrester-type pneumatic cells, two 10-ft. in parallel, air furnished by one Roots-Connersville 50-hp. blower.
42. Four vacuum tanks, cocoa-matting filter medium, capacity 300 tons pyrite conc. per day.
43. Wilfley pump, 4-in., 100-hp.

Lead Concentrates

Year	Dry Metric Tons	Pb, %	Zn, %	Fe, %	Ag, Oz./Ton	Insol., %	% Recovery, Pb	Ag
1930–31	41,358	75.6	1.4	4.3	28.4	....	96.6	....
1931–32	48,564	76.3	1.4	4.1	27.1	0.31	96.3	90.6
1932–33	58,851	77.5	1.5	3.5	24.5	0.38	95.6	88.6
1933–34	63,028	79.2	1.1	3.0	24.9	0.38	95.8	90.0
1934–35	64,874	79.9	1.1	2.6	24.1	0.37	95.8	89.7
1935–36	63,130	79.5	1.1	2.9	26.1	0.48	95.6	90.3
1936–37	70,486	79.4	0.8	3.2	27.2	0.41	96.1	94.2
1937–38	72,989	79.2	0.8	3.3	28.1	0.47	97.2	91.7
1938–39	65,561	79.5	0.5	3.3	31.0	0.39	96.9	91.9
1939–40	73,803	79,4	0.3	3.6	34.4	0.36	97.1	92.3

Zinc Concentrates

Year	Dry Metric Tons	Pb, %	Zn, %	Fe, %	Ag, Oz./Ton	Insol., %	Recovery, %
1930–31	32,770	0.8	50.3	12.7	...	....	84.6
1931–32	62,192	0.8	50.2	12.6	0.4	1.00	88.9
1932–33	83,298	0.7	50.4	12.4	0.4	1.30	90.5
1933–34	92,166	0.6	50.4	12.6	0.4	1.32	92.1
1934–35	94,146	0.7	50.1	12.6	0.4	1.43	91.6
1935–36	82,234	0.7	50.0	12.8	0.4	1.62	90.4
1936–37	69,863	0.8	50.0	12.8	0.4	1.60	90.0
1937–38	70,120	0.6	49.8	13.1	0.4	1.36	89.2
1938–39	53,182	0.5	50.2	12.9	0.4	1.19	88.2
1939–40	44,100	0.4	49.8	13.2	0.4	1.35	85.8

Note: Zinc-bearing mineral is marmatite, pure crystals assaying 53 to 54% Zn and 12 to 13% Fe.

Pyrite Concentrates

Year	Dry Metric Tons	Pb, %	Zn, %	Fe, %	% S,	Ag, Oz./ Ton	Insol., %
1930–33	No Production — Experimental Work Only						
1933–34	9,390	....	0.33	.....	50.9	.....	....
1934–35	39,340	....	0.38	.....	50.8	....	....
1935–36	57,037	0.18	0.20	46.49	51.02	0.32	0.64
1936–37	70,851	0.10	0.41	46.87	49.97	0.32	0.80
1937–38	100,027	0.18	0.71	46.09	49.33	0.32	1.07
1938–39	85,072	0.34	0.73	46.48	49.17	0.32	1.49
1939–40	68,772	0.16	0.91	46.34	49.12	0.32	1.26

pressor house, is supplied by a 2,500-cfm. Sullivan angle compound, a 4,000-cfm. Belliss and Morcom, and a 6,000-cfm. Ingersoll-Rand machine. The latter unit carries normal full load. Air is led to the mine by 8-in. Victaulic pipe, this type of pipe being used extensively throughout the mine.

The drill-sharpening, mechanical, carpenter, and other mine shops are fully equipped.

Ventilation, which in the upper part of the mine was natural, is helped by two electrically driven fans. A special ventilation shaft extends from the surface to the bottom working level.

A large modern village has been constructed at Stan Trg to house men and their families. Mine hostels equipped with dining rooms, baths, and modern conveniences have been built for single men and are run by committees, on which the men are represented. Amenities include a miners' hall, equipped with cinema projector and reading rooms; a first-aid building with six beds; and tennis courts. The entire village is served by a modern, water-borne sewage system. Purified water is piped to each house or building.

The mill building, and the power plant, smelter, and refinery, are situated at Zvecan, some six kilometers from the mine, occupying sites on the banks of the Ibar River close to the State railway connecting Belgrade to the north and Salonika to the south.

The ore is hand-tipped from the aerial ropeway into bins. After crushing, the ore may be stored in reserve ore bins or fed to the ball-mill feed bins as desired. Total mill bin capacity is about 4,500 tons.

The mill is equipped with three identical grinding units, each fed from its own storage bins, which can be operated independently of one another. Grinding operations follow standard practice, with ball mills operating in single-stage closed circuit with classifiers, the overflow from which is delivered by Wilfley pumps to the lead circuit rougher flotation machines. These are of the Fahrenwald type.

The products made are: lead, zinc, and pyrite concentrates. The equipment and practice are outlined in the accompanying flowsheet.

Final mill tailing from the pyrite circuit is pumped unthickened to an impounding pond, from which the clear overflow is allowed to run to waste. Water for mill operations is obtained from the River Ibar, being pumped to a settling pond, which is designed to insure a supply of clear water to the mill, even during the rainy season, when the water becomes muddy.

Reagent combinations are typical of normal lead-zinc-iron practice and present no unusual features.

Results of 10 years' milling operations are summarized in the accompanying tables.

Lead Smelter Added in 1940

Prior to 1940, all concentrates were shipped to various European centers for smelting, most of that product being shipped through the free zone of Salonika. In 1937, however, it was decided to erect a lead smelter and refinery at Zvecan, to treat lead concentrates. The smelter went into operation in 1940.

The smelter consists of Newnam hearths equipped with automatic rabblers, with appropriate flues and baghouse. Waste gases are led to a stack, 119 meters high, which disperses them without injury to the surrounding agricultural farms.

The blast furnace for the treatment of gray slag produced by the Newnam hearths was not in operation when the data here presented were recorded.

Refining of the lead bullion is carried out in the nearby refinery building. Lead, silver, bismuth, and zinc chloride products are obtained.

Risks of Mining Ventures Should Be Evaluated

ALFRED STRONG LEWIS, Mining Engineer, Phoenix, Ariz.

Venture capital wants to know three things: the degree of risk, the possible size of rewards, and the amount of money required to prove a particular mine venture. In stressing the need for this information, the author suggests an original approach to the problem which will be of particular interest to mining engineers.

THE MINING PROFESSION is confronted with the problem of replacements for those of its big producing mines which are approaching exhaustion of their ore reserves. There are several methods by which these replacements may be acquired. All of them boil down to two words—more prospecting. The field of prospecting may be divided into the three following general classes:

A. Extension of Known Ore Deposits

All producing mines are extending their ore reserves by exploration and development of adjacent mineralized areas. This prospecting is being done continuously with an aggregate expenditure of large proportions.

B. Marginal Ores

This class of ore becomes profitable by application of research which is progressively discovering new methods which in turn induce more prospecting. As production costs are reduced and the percentage of extraction is increased, these ores can be depended upon for doing their share of replacement.

C. Exploration of Small Mines and Prospecting Virgin Ground

Very little, if any, increase in activity can be expected under the headings A and B. Large companies are doing a good job of exploration work on their own ground. The new ore reserves thus developed will substantially prolong the life of these big mines, but the real reservoir of replacement remains in the small mines and virgin ground. The problem of supreme importance is how to tap this reservoir and get some big producers out of it.

The fact that prospecting and exploration work are being done on a large scale and with profitable results in Classes A and B poses the question: Why is it not also being done in Class C? The same principle of mining risk versus mining reward exists in all three classes, but there are vital features present in Classes A and B which are absent in Class C.

These features are: (1) the ownership of the ground and the capital required for exploration are in the same hands: (2) confidence in the potential value of the ground to be prospected has already been established in the minds of those who own the capital; (3) it is easy to make another bet with velvet, to take a chance with money which has not yet got into your pocket, especially when you are putting it right back where it came from. Although these features may explain the ease with which money is made available and is being constantly poured into prospecting Classes A and B, it can positively be stated in passing that this class of prospecting would abruptly cease if it failed to bring profitable results.

The difficulty in getting action in Class C comparable to that in Classes A and B is at once apparent. Although it would appear that the ownership of the ground and the ownership of the capital to develop it could be merged by a simple working out of equities in a business organization, the real problem is to convince outside capital of the potential value of the ground to be prospected.

The purpose of this article is to suggest a method of how the engineer may revise his technique of mine examination and report for presentation to those already willing to be convinced; in essence it is to lay on the table all the facts pertaining to risk, possible reward, and necessary expenditure. This will enable the capitalist to select his own bets and to accept such risk as he is willing to take.

Venture capital has never been timorous of known risks. It wants fair play, a run for its money, and definite knowledge that it is not contributing to a sucker game.

Almost all business men are using, in some form, the law of averages. It has been successfully used in many mining ventures. It appears to me that expansion and application of this law of averages to mine explorations would be effective in diminishing the over-all risk inherent in these enterprises. If it is conscientiously applied, it should result in bringing in many new mines. If the mining engineer, after digesting the many highly technical facts which he has assembled, will transpose these into simple terms of risk, reward, and expenditure, the layman, who is paying for the report, will be able to get a much clearer picture, which, in turn, should, incidentally, attract more venture capital to the mining field.

In the early days of mining there was no need to develop this idea. The engineer trained in exact for-

Table I. Minimum Risks, Expenditures and Rewards

Risk (Chance to Win	Minimum Ratio of Reward to Expenditure (a)	Minimum Number of Investments to Secure Favorable Odds
4 out of 5	2½ to 1	1
3 out of 5	3⅓ to 1	1
2 out of 5	5 to 1	3
1 out of 5	10 to 1	6
1 out of 6	12 to 1	7
1 out of 10	20 to 1	11

(a) All individual rewards must equal or exceed total contemplated expenditures. For discussion purposes it is assumed reward equals double the odds times expenditures

mulas considered it unethical to make a favorable report on a mining property where any risk was apparent. John Hays Hammond very successfully guided his clients to properties which were proved by the erosive action of Nature and were potentially good mines from the grass roots. He passed over and declined to recommend other good mines where the evidence was obscure. At that time, with the numerous opportunities existent, it seemed the wise thing to do. If one mine was missed, there were plenty more to take its place.

Bonanzas Scarce

The Hammond pattern of passing up all mines where the evidence of value was inconclusive is still being carried in stock by some mining engineers, but it is dying a natural death through lack of nourishment. There are no more surface bonanzas to be found. They passed out with the buffalo herds. Proved mines with blocked-out ore, an "all safe" label, and a "For Sale" signpost, are simply nonexistent. Therefore the engineer must now examine mines with a view of determining their value as ground for prospecting and exploration purposes.

Under the present set-up there is a large unfilled gap between the opinion of the prospector and the report of an examining engineer. The opinion of the prospector often takes some form of alibi to explain the absence of any ore in his surface showing. He may then add a very definite statement that his mine is the biggest mine in the world. All that is necessary to prove it is to sink a 500-ft. shaft on his claim.

The engineer makes his examination and writes a report. His report is customarily in the form of a complete turn-down or indefinite approval.

From the standpoint of capital that is willing to take risks, both the opinion of the prospector and the customary engineer's report are valueless. Venture capital wants to know three things: First, the degree or percentage of risks; second, the possible size of reward; and, third, how much money will be required to develop this particular mine venture.

With these three things evaluated, a mining enterprise is resolved into a good risk when there is a preponderant percentage in favor of a successful issue.

This gap between the prospector's opinion and the present type of engineer's report might well be filled by engineers who will evaluate the data assembled in their examination and render a report in terms of mining risks, mining rewards, and expenditures.

Even though this form of report may not be perfect, it is far superior to the present procedure, which commonly results in the layman making an erroneous evaluation of the often obscure data presented in the engineer's report.

Specify the Risk

The surgeon often explains to the patient his percentage of risk before operating; the attorney seldom takes a case without advising his client of the risk of losing it. The engineer is qualified to set out the degree of risk in a mining venture with the same degree of accuracy as the surgeon in his operation or the attorney in his court proceedings.

To focus attention upon this angle of reports by engineers and to bring out constructive criticism I herein outline the general plan I have adopted. This plan is simply my best effort in assembling ideas of procedure which have been in use by other engineers, and adding some ideas of my own.

The plan involves: first, determination of mining risk, expenditure, and mining reward; second, determination if the possible reward justifies assumption of the risk; and third, if possible, the grouping of enough risks to give the investor the benefit of the law of averages.

In classifying risks, it is convenient to divide them into three groups, as follows: (1) proved mines; (2) risks ranging from one chance out of five to four chances out of five to succeed; and (3) risks ranging from one chance out of ten to one chance out of six. Risks greater than one in ten are not considered worth attention unless an unusually large sum and number of opportunities are available. To fall within the second group, a property should have a substantial nucleus of proved ore. The third group will involve mainly probable or possible ore. Generally, risks involving only possible ore will be greater than one chance in ten to win.

What Expenditure?

Expenditure is here defined as the amount of money necessary to prove that the property is valuable. It does not include sums required to get into production, such as the cost of milling plant, roads, transport, mining equipment, power, or water supply. It need not even involve the expense necessary to evaluate the full worth of a property. It should be adequate, under ordinary conditions, to prove or disprove the existence of the value set up as mining reward.

The term "venture" as used in this discussion constitutes the expenditure required to prove or disprove a single ore deposit or mineralized unit of ground. However, several unrelated areas each containing a possible oreshoot could exist in a single property. Under these circumstances the investments required to prove the separate units could be regarded as separate ventures, or they could be combined to form a single venture, depending upon the willingness or ability of the investor to assume the entire risk, or his decision to select only the most attractive risks so as to better his chances to win. Boundary lines of a property do not necessarily determine the ex-

tent of a single venture, because ownership might be so distributed that a single venture could include property of several different owners; and, conversely, ownership might embrace an extensive group of holdings containing several unrelated ventures.

To be a justifiable risk, a mining venture should offer a possible reward of the expenditure times double the odds. This is an arbitrary figure based on experience, and might be regarded as a factor of safety to protect the investor against errors in judgment which might reasonably enter into the process of appraising a property's value, or chances to produce ore. In this discussion this factor is used merely as an ideal to work toward. Further study of case histories may well provide a logical basis for varying this factor.

In other words, a risk of one chance out of six to win should show a mining reward of $60,000 to justify an expenditure of $5,000. The $5,000 expenditure should be sufficient to prove or disprove the existence of a $60,000 value. If the possible reward does not measure up to at least 12 times the estimated expenditure, the venture should be dismissed as unsound for a one-in-six risk.

Grouping Investments

Some investors who can well afford to lose may be perfectly willing to take a single chance with the odds against them. However, most people who have venture capital would prefer a better run for their money. This can be given by grouping together enough risks—all meeting individually the foregoing specifications—to give the enterprise favorable odds based on the law of averages. Also, to meet this condition the mining reward must exceed the total expenditure contemplated. An investor has a fair chance to score a "win" against ten-to-one odds if he takes ten risks. However, if in one of these he risks a thousand dollars and in the others fifty dollars each (with reward at double the odds), his only chance to get his $1,450 back is to win on the thousand-dollar risk or to score two or more wins. The odds are against either of these possibilities. However, by substituting a $500 ten-to-one risk for the $1,000 one, the odds are brought in favor of the investor. His maximum expenditure is $950. He has an even chance to win, and if he wins a single risk he will get from $1,000 to $10,000. He has an excellent possibility of winning from $2,000 to $11,000. If he does what is highly improbable and wins on all risks, he stands to win $19,000. See Table I, which lists the minimum number of investments which must be made in ventures having identical risks in order to assure the investor of receiving rewards equal to or greater than total contemplated expenditures.

Table II. Grouping Risks With Varying Odds

Risk of Individual Investments	Desirable Ratio of Reward to Expenditures (a)	Estimated Ratio of Reward to Expenditure Based on I and II	I Estimated Expenditures	II Estimated Reward
2 out of 5	5 to 1	6.1 to 1	$18,000	$110,000
1 out of 5	10 to 1	10.5 to 1	4,000	42,000
1 out of 6	12 to 1	26.6. to 1	6,000	160,000
1 out of 7	14 to 1	16.6 to 1	3,000	50,000
1 out of 8	16 to 1	16 to 1	5,000	80,000
1 out of 9	18 to 1	32.5 to 1	2,000	65,000
7 out of 40			$38,000	

(a) Assuming that a justifiable risk is one in which the possible rewards equal the expenditure times double the odds.

However, it would be almost impossible to group together a number of mining risks all of which would present similar odds. Therefore our method must be adapted to grouping risks of different degree together in such a way as to benefit from the law of averages. In the table shown above a number of risks have been set up, each one sifted so that a "win" on any one would more than recover the total expenditure contemplated for all. However, proceeding from the top down it is not until the group includes six risks that the odds turn in favor of the investor. At this point he has one chance out of 5 5/7 to win on a total of six risks. Eventually the grouping of suitable risks resolves the odds in his favor, even though, as in the example, the individual risk in each added case is higher.

Smaller Risks

If risks of lesser magnitude were grouped, a smaller number would suffice to yield favorable odds. Overall odds would improve as new risks are added, with the qualification that total expenditure would usually reach a point where a single win would not pay out the whole commitment.

The grouping of risks also has another advantage. In a mining venture a certain expenditure is necessary to prove or disprove worth; an additional investment is necessary to put a property, if found worthy, into production. Usually the reserve fund necessary to get into production is larger than the amount risked in proving value. In a group of risks a single reserve fund much smaller in proportion to the amounts risked will suffice to finance those that prove to be valuable.

The Principal Points

The nature of mining risks is such that more extensive elaboration of the law of averages would be impractical. Some risks may return a partial reward in execution. Many will develop unforeseen potentialities, good or bad, as new evidence is adduced. The main points to keep in mind are: (1) Engineering and geological reports should make quantitative evaluation of risks and rewards; (2) a venture should not be recommended unless the possible rewards are commensurate with the risk, the normal expectation being that the reward should be at least double the odds times the expenditure necessary to prove the anticipated value; (3) if possible, risks should be grouped so as to give the investor a better run for his money based on the law of averages. Mining has passed the day when there are many opportunities to obtain favorable odds in single ventures. However, risk capital is available if engineers can only give investors a clearer picture of risk, necessary expenditure, and possible rewards, and then point out opportunities to reduce risk by a balanced grouping of ventures.

Diamond Drilling Features Mountain Copper's Mining

JOHN B. HUTTL, Associate Editor

Company completes a half century of continuous activity. Its work on the flotation of its complex ores a possible stimulus to reviving other operations in once-important Shasta copper belt.

FOR THE MOUNTAIN COPPER CO. 1946 marks the fiftieth year of continuous operation at its Iron Mountain property, in Shasta County, Calif. Active since 1896, this mine, which is 13 miles northwest of Redding, remains a substantial producer of pyrites, zinc, and copper. Only once, moreover, during its long life has the company failed to earn its full operating expenses—an enviable record, for which a good mine plus able, conservative management are largely responsible.

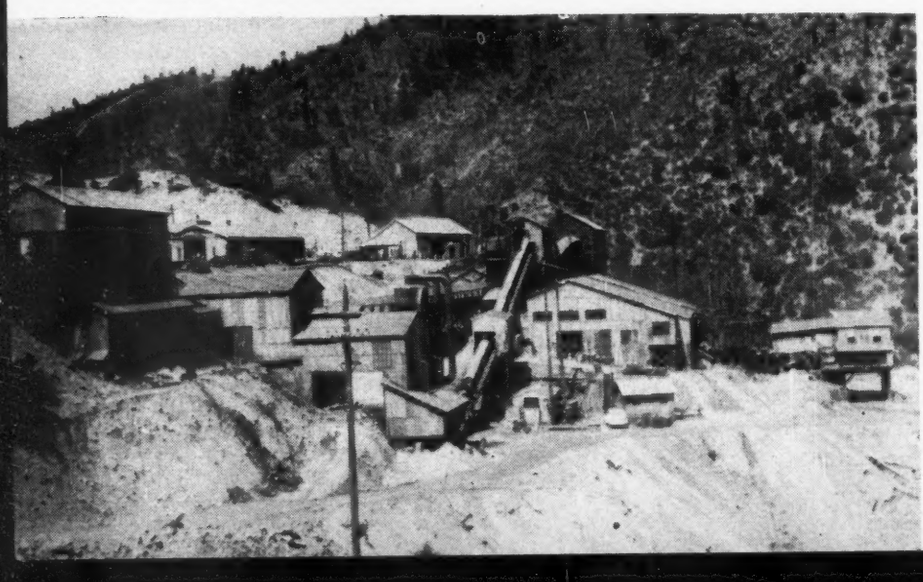
History Interesting

The discoverer of the new deposit, a land surveyor named Magee, acquired it on the theory that it was valuable for its iron. It was subsequently relocated by one James Sales, who thought it valuable for its silver. Sold in 1886, the mine was equipped with a 20-stamp mill with amalgamation pans to handle surface gossan ores. After spending $100,000 thus, the operators found the ore too base for treatment by free milling, and subsequently let the property go.

It was offered for sale in the United States and in London up until 1895. The property finally came to the attention of C. F. Fielding, of New York, and after examination by Alexander Hill, of London, passed into the hands of Mountain Copper Mines Co., Ltd., from which Mountain Copper Co., Ltd., a British concern capitalized at $6,750,000, acquired control in 1896. The mine at that period was worked for copper, and for a time was among the larger producers of the metal. Late in the 90's, the company established successful blast-furnace smelting of the high-sulphur copper ores at the plant at Keswick, and pyritic smelting with the aid of hot-blast stoves became standard practice for a time.

A desire to utilize the sulphur closed this plant in 1908, and smelting was transferred to Martinez, Calif., where the company produced sulphuric acid, fertilizers, gas purifier, and bluestone in addition to the metal. Ore was taken principally from the Iron Mountain section, being a mixture of pyrite, sphalerite, and chalcopyrite, pyrite predominating, with some chalcocite and covellite and small amounts of gold and silver. Blast-furnace feed averaged 7½ percent copper and 40 percent sulphur. Insoluble silicious residue ranged from 5 to 12 percent.

MODERN FLOTATION PLANT, of 350-tons capacity, which Mountain Copper Co. Ltd., in Shasta County, California, erected to treat the complex copper-zinc ores from its Mattie and Richmond Extension deposits.



Cyaniding Stopped in 1942

In recent years, up to the outbreak of World War II, the company's activity was centered chiefly in producing pyrites from its Hornet mine for shipment to chemical plants in the Bay area, and in open-pit mining of gold-bearing surface gossan in the Iron Mountain portion of the property. The latter material was cyanided in a 700-ton plant (described by G. J. Young in *E.&M.J.*, June 22, 1931). This activity ceased on Feb. 1, 1942, for economic reasons. The original Hornet claim and adjacent ground had been purchased in September 1895, the discovery, according to Mr. Kett, consisting of a small showing of mineralized material exposed by erosion in Boulder Creek. This proved to be the point of a triangular-shaped orebody that widened with development, until at 1,200 ft. from the portal of a tunnel that followed one of the walls it showed a width of 225 ft. of solid pyrite, high in sulphur but having only a nominal amount of copper and practically no gold and silver.

A fault apparently cut off the ore at this point, but diamond drilling and other development indicated the possibility of some 4,000,000 tons in the original Hornet orebody, with additional orebodies at higher elevations. Though the potential value of the deposit was in question at that time because of absence of a

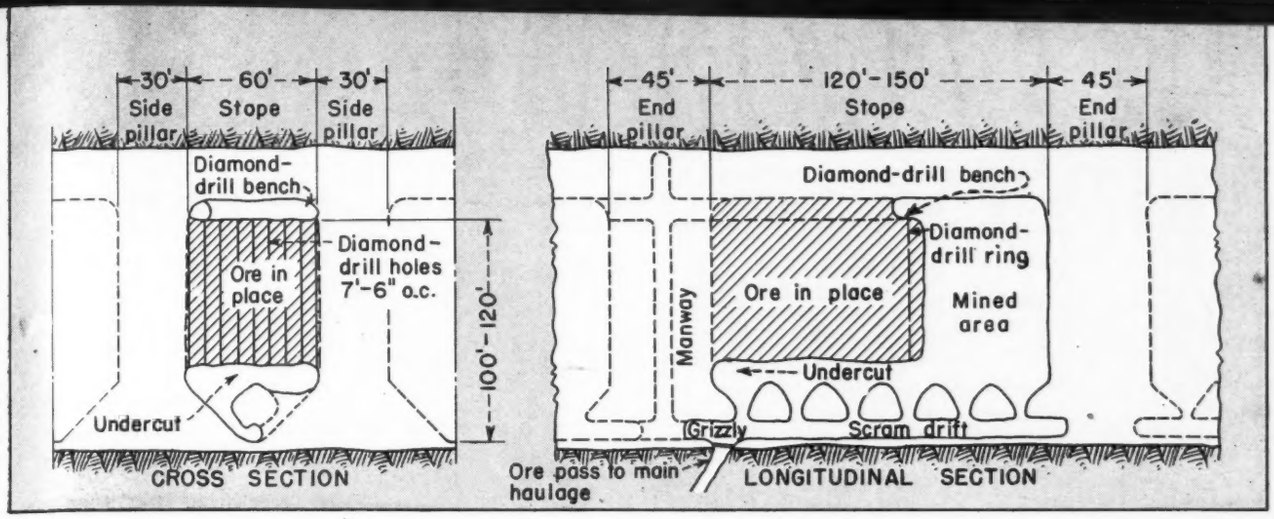


FIG. 1. **DIAMOND DRILLING** in a typical pyrite stope in Richmond orebody. This procedure is considered as standard. It was adopted in 1944, patterned after the Aldermac sublevel bench system, that had been developed earlier in Northern Quebec.

market for pyrites, Mr. Fielding, already mentioned, was much intrigued by the possibility of making acid. He was familiar with what had been done at Rio Tinto, in Spain, and in addition believed that the grain lands in California had been exhausted. The venture into the fertilizer field that followed proved disappointing, but the increased production of petroleum in California called for large quantities of sulphuric acid for refining, and this eventually justified Mr. Fielding's optimism. Mining on the Hornet deposits was started on a large scale in 1907 and has continued ever since.

Mining at Present

The current mining operations are in the area that lies beyond the fault and above the original orebodies served by the Richmond tunnel. It is known as the Richmond section of the Hornet orebody, and is a large lenticular replacement deposit about 1,500 ft. long and 500 ft. wide, with a maximum thickness of 250 ft. The main strike is northeast-southwest.

For some time, and during the period of maximum size, the orebody was mined by an adaptation of Alaska Juneau powder-blast caving. After establishing grizzly chambers and draw holes, stopes measuring 125x125 ft. were undercut. Powder was introduced from small raises. The largest shot ever fired in the mine used 225 cases of powder (50 lb. per case), and the smallest 30 cases. Broken ore was drawn through the grizzly chambers. The objectionable features of the method were the difficulty in controlling breakage, and damage done at times to underground installations by the large powder shots.

In 1944 this method was abandoned for blast-hole diamond drilling pattern after the Aldermac sublevel-bench system. A standard was established after study, to be followed as long as the orebody and ground now mined remain unchanged.

When gossan mining was stopped in 1942, activities were reduced to mining pyrites only, in a day of wartime high production costs. Scarcity of base metals and the incentive premiums offered directed attention to the potential values of the Mattie orebody, which had been discovered in driving the Richmond tunnel. Diamond drilling in 1939 revealed 180,000 tons of possible ore containing 2.25 percent copper and from 3.5 to 4 percent zinc. Tests by E. F. Robinson, metallurgist at the Martinez laboratory, encouraged him to propose a flotation plant to the management. Possible recoveries were indicated at 75 percent of the copper and 40 to 45 percent of the zinc. On the Mattie tonnage alone, the venture was not too promising, but this, coupled with the similar Richmond Extension orebody then being explored, led to a favorable decision, and the mill was built and started July 5, 1943. Most of the equipment and buildings were obtained from the company's abandoned Big Canyon gold mine, at Shingle Springs, in El Dorado County, and from the Iron Mountain cyanide plant.

The Mattie orebody, cut about 600 ft. from the Richmond tunnel portal, is a typical lens-shaped, massive pyrite deposit. Roughly two-thirds of it was enriched in copper and zinc, and showed a reasonably sharp assay wall. Mining was done by sublevel stoping using blast-hole diamond drilling. As will be seen, a scram drift was driven each way from a central incline shaft at the bottom of the deposit, followed by undercutting through its entire length and opening of a narrow vertical stope at each end to serve as a slot toward which blast holes could be broken. The diamond-drill holes were drilled in a ring pattern from a central adit near the back of the orebody. A maximum of 6 ft. of ground was broken with each ring, holes being spaced no more than 10 ft. apart at their ends. The longest holes perhaps were 75 or 80 ft. in length. Rounds were blasted with 60 percent gelatin and Primacord.

Caving in the Mattie

Results were fair at the start, but as the stopes got bigger, there was much overbreak and caving occurred, yielding large boulders, which increased the secondary blasting materially. Wall dilution was experienced throughout the mining of the Mattie deposit; yet, practically 85 percent of the calculated ore was extracted before the final cave-in. This was retarded by the large transverse pillar (about 30,000 tons) required to sustain the main haulage system to the pyrite orebody. Final computations indicated that 121,880 tons of the original 180,000 tons was recovered.

The copper-zinc ore treated currently at the flotation plant is mined from the Richmond Extension orebody which was explored and developed during the exploitation of the now-exhausted Mattie deposit. It is like the Mattie ore. It occurs along the southwest wall of the main pyrite deposit, and represents an enrichment of copper and zinc sulphides within the pyrite mass. No definite conclusions have been reached as to the origin of this enrichment. Minor faulting has been

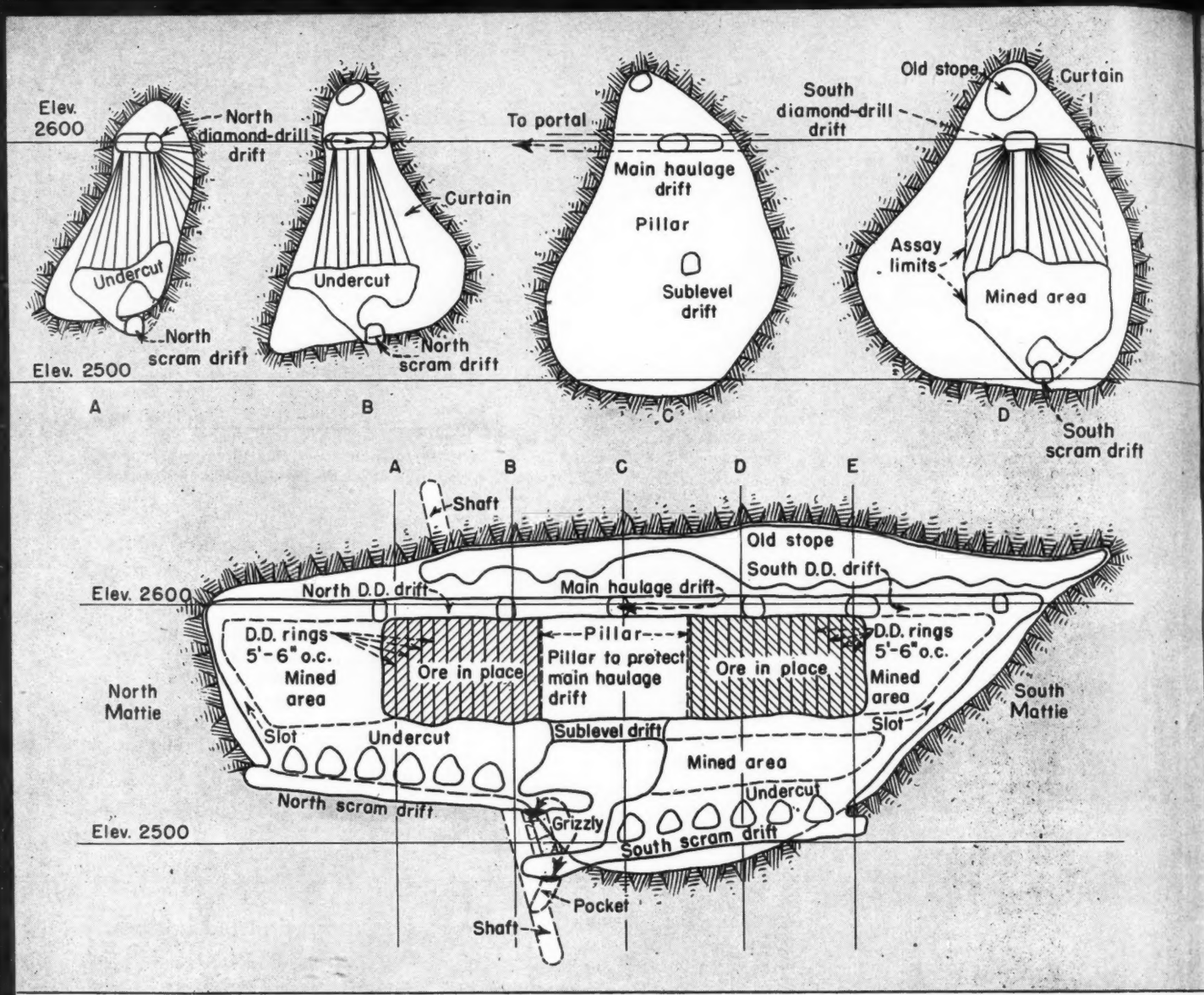


FIG. 2. MINING IN MATTIE OREBODY, before final cave-in, was done by sublevel stoping with diamond drilling in rings 5 to 6 ft. apart from central adit or drift near top of orebody as shown. Deposit was first undercut from scram drifts at bottom and slot stope was cut at each end to provide free face for blasting. Old stope at top had been mined long before diamond drilling began. Curtains were maintained to support country-rock walls. The five cross-sections look north.

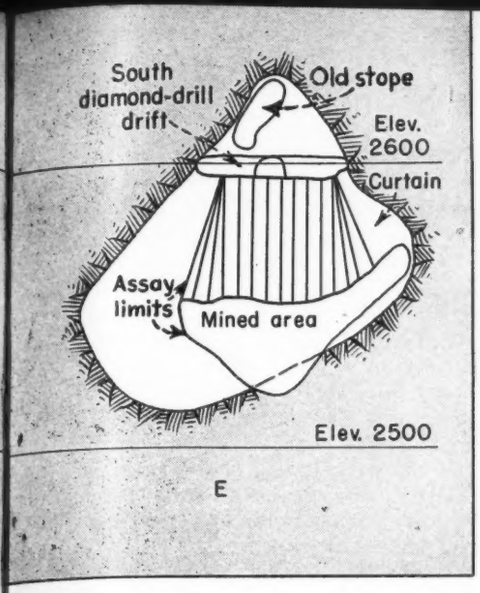
found along this enriched zone, but not major displacement. Along its southwest wall the main pyrite orebody is thinned down to a maximum of 50 ft. The zinc occurs as marmatite and copper as chalcopyrite. In general the two sulphides are finely disseminated in the pyrite.

The Richmond Extension is mined by room-and-pillar method. At first experiments were made with blast-hole diamond drilling. Owing to the deposit's tabular form, diamond-drill holes were drilled flat from stope ends over undercuts. This was stopped when it was found that the character of the ground lent itself to room-and-pillar mining. Diamond drills, however, are still used in removing special sections and for pillar recovery. Briefly, the stopes are established at right angles to the main scram or slushing drift, which is driven about 150 ft. along the strike and on the footwall. From this drift steep raises are driven to within 10 ft. of the hanging wall and stope widths established at 30 ft. by slabbing to the raises. The raises are then continued parallel with the hanging wall, with the 10-ft. curtain maintained, to the end of the orebody, which is usually 150 ft. Thus, each completed raise becomes the center line of the stope to be mined and the crown of the arch. Subsequently the stoping is underhand. Material broken during the advance of the flat sections of the raises is slushed to the steeper sections by scrapers operated from short crosscuts off the scram drift opposite each raise collar. Pillars between stopes are 15 ft. wide, and, as the completion permits, these are being reduced in size by interlocking raises and diamond-drill slabbing. Additional recovery probably will be made when the ends are reached and a general retreat is permissible.

All drilling is done with stopers using 1-in. hollow quarter-octagon steel with detachable bits. Holes are blasted with 40 percent dynamite and fuse. Diamond-drill holes are shot with 60 percent gelatin and Primacord.

Milling

In treating the Mattie and Richmond Extension ores by flotation, the company has done important pioneering work that might well bring about a revival of mining in the once-important Shasta County copper belt. The ore is complex and the metallurgy is difficult. It is a massive pyrite containing varying



amounts of copper and zinc, and averages 1.5 to 3.5 percent in copper; 2 to 6 percent in zinc; 36 to 38 percent in iron; and 4 to 6 percent insoluble, with the remainder sulphur. It also varies greatly in hardness and texture. Although all of it is fine-grained, at times this is so fine as to appear amorphous.

The treatment in the modern 350-ton flotation mill is explained in the flowsheet.

Crushing in Three Stages

Milling comprises crushing to minus $\frac{3}{8}$ in. in three stages; closed-circuit grinding; flotation of classifier overflow in the copper circuit; conditioning and activation with copper sulphate of the tailings for the zinc circuit; and thickening and filtering of the final concentrates. To obtain good extraction, it is necessary to grind to at least 80 percent minus-325 mesh. Currently, about 360 tons of ore is ground per day, 2- and 3-in. balls being used in the primary mill, and $1\frac{1}{2}$-in. balls in the regrind mill. Primary classifier overflow is about 55 percent minus-325 mesh, and that from the bowl classifier 75 to 90 percent minus- 325 mesh.

Ore behavior in the flotation cells is extremely variable. Success had to date has been due mainly to careful operation and to making frequent changes in the reagents and the manipulation. As a rule, a pH of 8 to 10 is maintained in the copper circuit. Alkalinity is kept as low as possible to minimize the damage to the copper sulphate in the zinc conditioner. Lime for the copper circuit is added dry to the ball-mill feed belt. Aero cyanide (0.1 lb./ton) and zinc sulphate (0.2 lb./ton) for iron and zinc depression are also added to the ball mill. Copper promoters are Thio 130, (0.08 lb./ton) in the ball mill, and varying quantities of Z3 (0.2-0.3 lb./ton) and Z-5 (0.1 to 0.3 lb./ton) in the copper conditioner and cells proper. In general, the Z-3 is added to the copper conditioner, and the Z-5 is distributed by means of a manifold box-and-pipe arrangement, locally called a "spider," to designate flotation cells. Part of the Z-5 is diverted to the conditioner tank when the copper floats poorly. Frother, either B-23 or a mixture of three parts B-23 and one part pine oil, is added to the conditioner. Consumption is less than 0.1 lb./ton, chiefly because the xanthate or its decomposition products cause much frothing themselves. When necessary, and to maintain pulp temperature at 70 deg. F., steam generated in a modern 75-hp. boiler is introduced into the copper conditioner.

The zinc circuit is much more difficult to operate than the copper circuit. Flotation heads are likely to vary from 3 to 7 percent zinc during a single shift. There is no uniformity in the marmatite-sphalerite ratio of zinc mineral. Frequently, extraction must be sacrificed to get and maintain a 47 percent zinc concentrate. Proper conditioning is difficult at times. Owing to the high alkalinity of the copper circuit, the lime destroys much of the copper sulphate before it has time to work, and consumption of copper sulphate is high (1.5 lb./ton). Attempts to bring the zinc conditioner pulp back to neutral to secure better conditioning by adding proper amounts of sulphuric acid proved unsatisfactory, chiefly because it increased further the excess of water-soluble sulphates in the ore. Experimental work with copper-ammonium sulphate is in progress.

About 60 percent of the plus or minus 0.3 lb./ton Z-3 is added to one or the other of the two conditioner tanks, the behavior of the float deciding which one. The remaining portion is distributed to the cells through a "spider" as in the copper circuit. Zinc pulp tem-

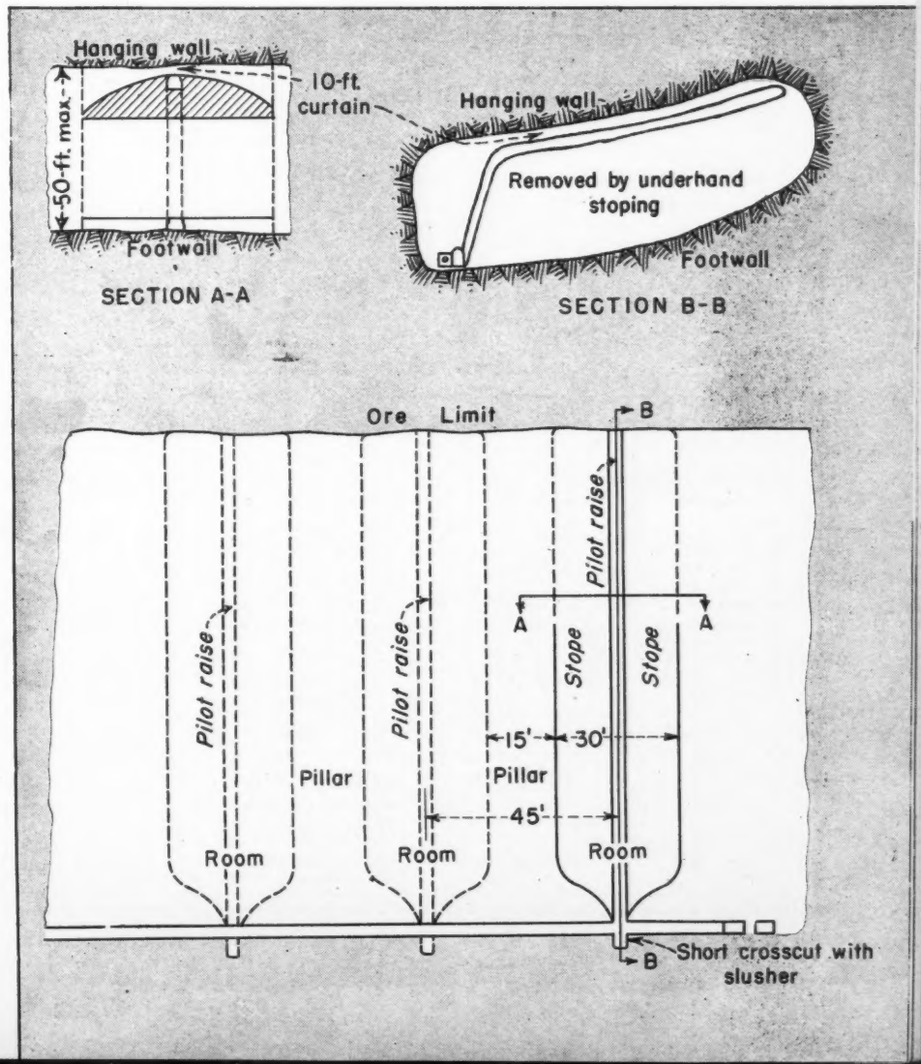
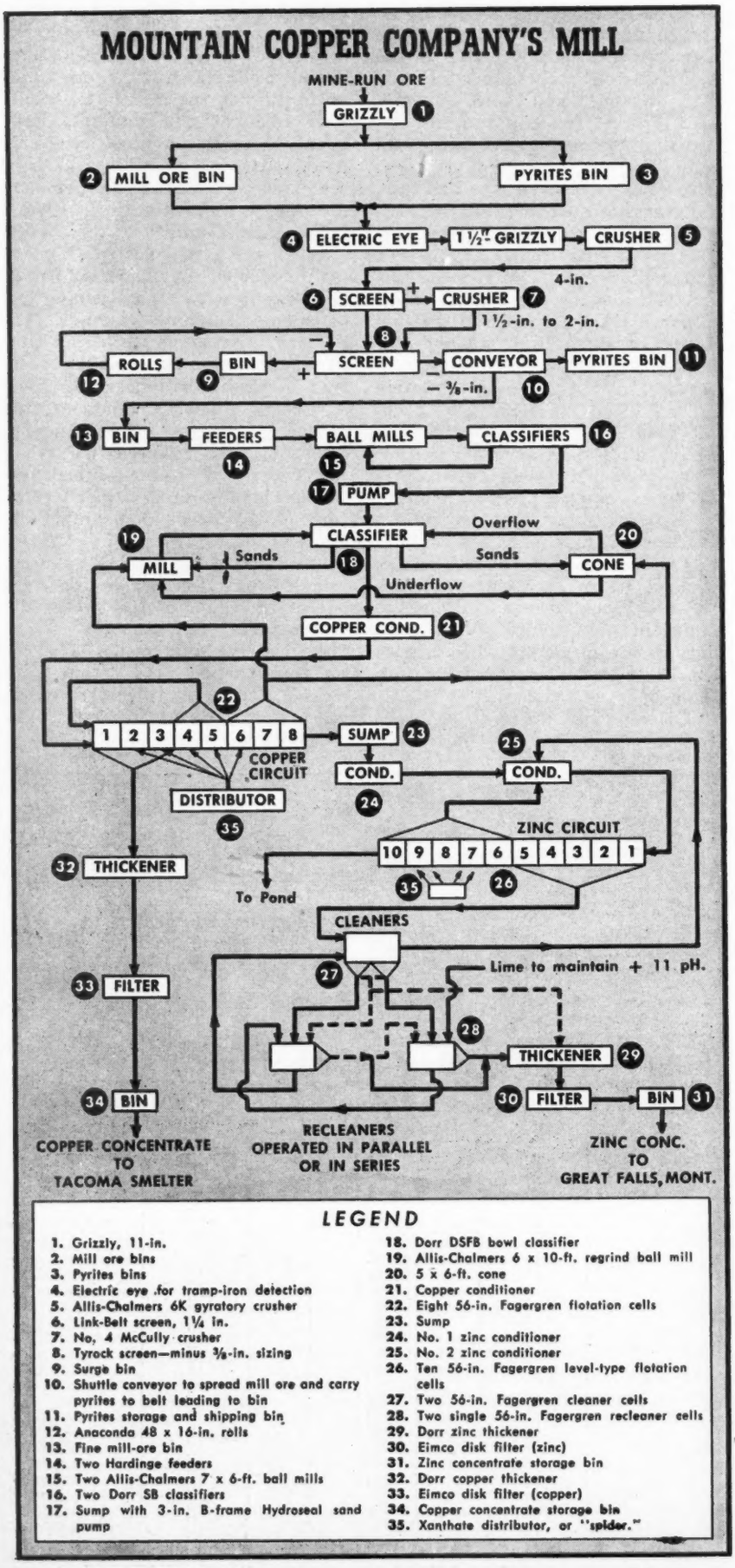


FIG. 3. COPPER-ZINC ORE currently treated at flotation plant comes from Richmond Extension orebody, mined by room-and-pillar method as shown. Diamond drilling is employed only for special sections and for recovering pillars.



LEGEND

1. Grizzly, 11-in.
2. Mill ore bins
3. Pyrites bins
4. Electric eye for tramp-iron detection
5. Allis-Chalmers 6K gyratory crusher
6. Link-Belt screen, 1¼ in.
7. No. 4 McCully crusher
8. Tyrock screen—minus ⅜-in. sizing
9. Surge bin
10. Shuttle conveyor to spread mill ore and carry pyrites to belt leading to bin
11. Pyrites storage and shipping bin
12. Anaconda 48 x 16-in. rolls
13. Fine mill-ore bin
14. Two Hardinge feeders
15. Two Allis-Chalmers 7 x 6-ft. ball mills
16. Two Dorr SB classifiers
17. Sump with 3-in. B-frame Hydroseal sand pump
18. Dorr DSFB bowl classifier
19. Allis-Chalmers 6 x 10-ft. regrind ball mill
20. 5 x 6-ft. cone
21. Copper conditioner
22. Eight 56-in. Fagergren flotation cells
23. Sump
24. No. 1 zinc conditioner
25. No. 2 zinc conditioner
26. Ten 56-in. Fagergren level-type flotation cells
27. Two 56-in. Fagergren cleaner cells
28. Two single 56-in. Fagergren recleaner cells
29. Dorr zinc thickener
30. Eimco disk filter (zinc)
31. Zinc concentrate storage bin
32. Dorr copper thickener
33. Eimco disk filter (copper)
34. Copper concentrate storage bin
35. Xanthate distributor, or "spider."

FLOWSHEET of Mountain Copper Co.'s modern 350-ton flotation plant at Iron Mountain, Shasta County, Calif., for treating its massive pyrite ores carrying zinc and copper.

perature is held to a minimum of 80 deg. F. by introduction of live steam into conditioner No. 1. Optimum pulp temperatures lie between 85 and 93 deg. F. Frother used in the zinc circuit is Aerosol OS, and consumption never exceeds 0.006 lb./ton. When the zinc grade is high, the Aerosol is augmented with Aerofloat 15, (0.01 lb./ton), largely because of the promoting effect of the latter reagent. This is discontinued when the zinc floats poorly, for Aerosol then pulls too much iron. Reagent 633 (0.08 lb./ton) is added to conditioner No. 2. It effectively depresses the little insoluble material in the pulp and acts as a slime dispersant.

Zinc Cleaning Flexible

The zinc cleaning and recleaning circuit is arranged for maximum flexibility. Cleaner concentrates can be sent directly to the filter when the grade is high, but in general the concentrate from each side of the cells goes to one of two recleaner cells. When one-stage recleaning is insufficient to produce 47 percent grade, all cleaner concentrate is directed to one recleaner cell, the resultant concentrate receiving additional treatment in the second recleaner.

Hourly assays are run on the zinc concentrate. The method used is relatively simple, and assays can be made by untrained personnel. As the iron-zinc ratio in the concentrate is definite, a dichromate iron assay can be run in 20 min. and the zinc content determined to within 0.5 percent, which is close enough to guide the operators. The method was developed by Henry Clineschmidt, one of the assayers. Copper concentrates are shipped to Tacoma, and zinc concentrates to Great Falls. The pyrites, crushed to ⅜ in. in the mill crushing plant, is shipped to San Francisco chemical plants.

In conclusion, I wish to thank William F. Kett, general manager, for permission to publish the foregoing article. Grateful acknowledgment is also made to J. G. Huseby general superintendent; C. W. McClung, mine superintendent; and to R. K. McCallum, mill superintendent.

Pan-American Congress Soon to Visit Brazil

FERNANDO BENITEZ, Member of Chilean Section of "Ipimigeo"

THE FIRST PAN-AMERICAN CONGRESS of Mining Engineering and Geology, which convened in Santiago, Chile, in January, 1942, decided to hold another Congress within three years, and selected Brazil for the future meeting. This second Congress will be held from Oct. 1 to Oct. 15 in Hotel Quitandinha, Petropolis, near Rio.

For many reasons the selection was fortunate. In the first place, the capital of Brazil is one of the most beautiful cities in the world. As a mining country, Brazil has a great future. Its people are famed for their hospitality and courtesy.

The country is richly endowed with minerals. The hematite ores of Minas Gerais, estimated at 6,000,000,000 tons of ore containing at least 50 percent iron, are considered the greatest known reserves of this important mineral. Brazil also has many high-grade manganese deposits; gold is of widespread occurrence; there is an abundance of quartz crystal; deposits of coal, bauxite, zirconium, monazite; precious stones, especially diamonds, amethysts, topaz and aquamarines; and other less important minerals.

Brazil is also the largest of the Latin American countries, with 3,200,000 sq. mi. and a population of 45 millions. Its recent industrial development can be considered a great achievement.

Although the Pan-American move had originally only a political purpose, it has widened out to include practically all fields of endeavor. Mining engineers and geologists, constituting perhaps the most internationally minded of all professions, gave proof at the first Congress in Santiago that no group is more willing to exchange information and experience than those whose task in life is to win ores and extract their metals for the use of mankind.

As organized by the Brazilian section the program of excursions is both interesting and instructive. Each excursion will last from Oct. 6 to Oct. 13. The first will include a trip by plane to Victoria to visit the iron and steel works there; the installations of the iron ore company of Vale do Rio Doce and the Itabira deposit; the towns of Monlevade, S. Jao de Morro Grande, Belo Horizonte, and their industries; the quartz deposits of Sete Lagoas; the famous gold mine of St. John del Rey in Morro Velho; the town of Ouro Preto and its aluminum plant, and then back to Rio.

To Minas Gerais

The second excursion will include visits to gold, manganese and quartz deposits and to the Algonkian area of Minas Gerais. It will include trips to Conselheiro Lafaiete, the manganese mines of Morro de Mina, and the iron mines of Casa de Pedra and Belo Horizonte; a plane trip to Diamantina and visits to the nearby diamond mines and that of river Jequitinhonha. Once in Belo Horizonte this excursion is similar to No. 1.

The third excursion will take in the coal deposits of southern Brazil, the ports and town of Florisnopolis, Imbituba, Laguna, coal mines of Lauro Muller, Urucanga and Criciuma, the National Department of Mineral Production, Porto Alegre, coal mines of Sao Jeronimo and Butia.

The fourth excursion will take in the bauxite, zirconium and tungsten deposits and the metallurgical works of Sao Paulo, iron and steel works of Mogidas Cruzse and the large, new steel plant of Volta Redonda.

The fifth excursion will cover the Gondwanic formations of southern Brazil, including Florisnopolis, Imbutaba, Laguna, Capiveri de Baixo, coal mines of Lauro Muller and White, Sao Joaquim, Lages, Rio do Sul, Curitiba.

President of the Brazilian section of the "Ipimigeo" is Engineer Antonio José Alvez de Sousa and the secretary-treasurer is Engineer Annibal Alvez Bastos. American engineers wishing further information should contact Dean Edward Steidle, of the School of Mineral Industries, Pennsylvania State College, Penn., who is president of the United States section.

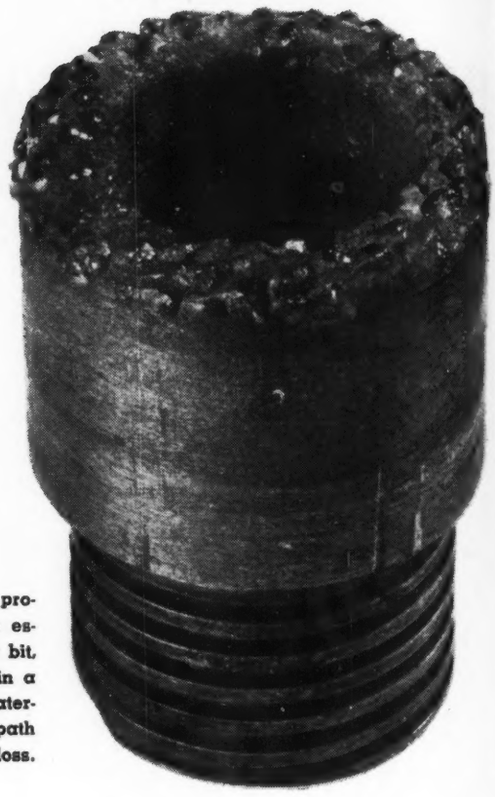
(The cost of attending the Congress, estimated in United States currency for a round trip by air between Rio de Janeiro and Miami, Fla., is approximately $900. This includes $765 for the journey by Pan-American Airways (tax and 15 percent discount offset each other) and about $135 for expenses in Rio, including one of the five simultaneous eight-day trips.)

THE HARBOR of Rio de Janeiro and part of the city.

What Goes On In

Various factors have a bearing on the performance of the bit

PATRICK ADAMSON, Wheel Trueing Co., Detroit, Mich.



1. INSUFFICIENT CLEARANCE was provided for the cuttings from the ID to escape over the face of this EX coring bit, which is set with large Congo bortz in a beryllium-copper matrix, and has no water-grooves. They therefore cut their own path to the OD, with resultant diamond loss.

DIAMOND DRILLING is a grinding operation. Recent improvements and innovations in bits and machines have tended to make it precision grinding. As this tendency continues, more of the known techniques in the field of abrasives can be applied to the design and manufacture of diamond-drill bits.

The quality, size, and shape of the diamonds used in diamond drilling have considerable bearing on the performance of the bit. They should always be so placed in the matrix that the best use is made of their qualities. Price is not always a clue to their economic performance as abrasives, which explains why the use of carbonados gave way to the use of high-quality drill bortz, which, in turn, has been superseded in many instances by moderately priced bortz and, occasionally, by congoes (or Congo bortz).

Pure formation in diamond structure tends to become increasingly rare as the size of the diamonds increases. Their efficiency as an abrasive medium, however, runs in proportion to their quality when they are properly applied. Generally speaking, hard, dense formations require small diamonds of good quality, whereas soft, loosely cemented formations can be drilled economically by larger diamonds of somewhat poorer grade. The complete range of rock formations can be drilled with maximum efficiency when the complete range of diamonds, as produced by nature, is available. In practice the range of diamonds available is, for one reason or another, restricted; and this has been one of the factors contributing to slow development. The most economical applications of the available material are being evolved by experience and constant experiment. Footage costs are gradually being reduced and the potential uses for diamond drills are being extended. The bit is vital to this progress, and an understanding of its action, its strength and its weakness, as well as its proper application becomes increasingly important.

2. CUTTINGS have formed grit tracks between the diamonds, and remnants of the sludge can still be seen on the face of this EX coring bit, which is set with West African bortz in a tungsten matrix and has two water-grooves. Particles trapped on the ID caused severe abrasion of the matrix and loss of diamonds before escaping via the water-grooves, which are also badly worn.

With the introduction of mechanical setting, the manufacture of bits developed along two lines: a molten metal-casting process and a powdered-metal method. In the casting process the diamonds are placed in a mold and held in position either by suction or by a sticking medium, or both. The metal is then poured over them. The choice of metal for the matrix is somewhat limited in this process because the melting point should be relatively low, and there must be free flow below the temperature at which diamonds begin to carbonize. The metals most commonly used are alloys of copper, aluminum, manganese, and nickel, principally beryllium-copper and aluminum or manganese bronze.

Matrix of Metal Powder

The powdered-metal method, which is now the more widely used, allows greater freedom of choice in the matter of matrix material. Tungsten, cobalt, nickel, copper, iron, aluminum, and molybdenum, among others, may be used to produce a more abrasion-resistant matrix. The diamonds are placed in a mold into which metal powder is then pressed, and the mass is sintered together. It is also possible to impregnate the powder with diamonds, resulting in a diamond-impregnated crown, which can be used

the Diamond-Drill Hole?

most advantageously in certain drilling operations.

Factors in Drilling

Much care is needed in the proper application of diamond bits to rock, particularly during the first few feet of drilling. Diamonds are brittle and require adequate support from the matrix. They will fracture easily under percussion, excessive vibration, or loss of matrix support due to abrasion. They will also fail because of burning if proper circulation of coolant, usually water, is not maintained. The water also plays an extremely important part in the operation by removing the sludge, or fine rock particles, as the bit penetrates the formation. If the volume and pressure of water across the face of the bit are insufficient, or the design of the bit is incorrect, the cuttings cannot pass away freely, with the result that they are ground up several times before being ejected. This decreases penetration speed while increasing diamond wear. Other undesirable conditions are induced at the same time. Matrix wear is increased, thereby withdrawing some of the support given to the diamonds (see photographs 1 and 2). Circulation passages can become blocked, so that an already bad condition is quickly made worse. Rapid deterioration of the diamonds and even burning of the matrix will result. Bits will also mud up and ball up in soft formations, causing serious loss of time. The question of correct circulation of water is often overlooked, with consequent decrease in efficiency and penetration speed. Increased efficiency of the drilling operation will certainly result when this factor is given proper consideration.

Weight and Speed Also Affect Performance

Pressure or weight on the face of the bit while in operation, and correct rotational speed, are two further factors which materially affect the bit performance. Diamonds will withstand very heavy application of weight if they are adequately supported, and this fact has often led to overloading. The fact that diamonds do not shatter under such conditions, and that damage is not readily apparent to the eye, have caused the true effect of overloading to be overlooked. The effects are twofold. High pressure generates heat of itself, which in turn helps to accelerate wear on the diamond. It also forces the diamond into the formation to a depth at which it must take a heavier cut than it was originally designed to do, either by reason of its size or by the distance it protrudes from the matrix. This sets up a heavy impact load, which may cause breakdown, and it also increases the size, and therefore the volume, of the cuttings, so that the arrangements designed for their free passage become inadequate (see photograph 3). The same condition then prevails as when the volume or velocity of the water is insufficient. The bit grinds its own cuttings several times over before getting rid of them; and the effects of this action have already been noted.

Determining the Correct Rotational Speed

The rotational speed of the bit determines the time interval between successive attacks upon the rock formation by the diamonds themselves. The correct rotational speed varies in different types of rock, and it also varies in ratio to the amount of clearance of the diamonds over the matrix, and with the velocity of the water. The correct speeds vary, however, within well-defined limits, which can be set for varying sizes of bits, both coring and solid types. When diamonds are forced into the rock formation, and rotated, they either break the bond holding the rock particles together or they cause a conchoidal fracture of the material itself. The former action takes place in drilling sandstones, and the like; the latter action takes place in drilling such formations as chert or quartz. In either circumstance a fragment is loosened from its surroundings, and sufficient time must elapse for its removal before another fragment is removed. This time interval is infinitesimal, but it is vitally important.

Two factors control this removal: the size of the fragment in relation to the size of the passage designed for its removal, and the velocity of the water which removes it. The control of these factors lies in the size and projection of the diamonds, together with the weight on the cutting face of the bit; the design or pattern in which the diamonds are set and the arrangement of the water-grooves; and the volume and velocity of the water passing over the face of the bit. The rotational speed must be such that these controllable factors can work smoothly together in a coordinated manner.

There are two further considerations in determining correct rotational speed. The first is the fact that centrifugal force aids in moving the cuttings towards the periphery of the bit; but this does not mean that a bit is self-clearing.

3. THIS EX CORING BIT, having two water-grooves and a tungsten matrix impregnated with diamonds throughout, shows severe wear and shearing of the stones. The ID is polished and the face shows two low spots immediately behind each water-groove. These points could not have been in contact with the bottom of the hole while the bit was in use, but were worn down by cuttings being forced out behind each water-groove.

because the cuttings from the axial portion usually do not escape without being reground on the face of the bit while on their way to the periphery. Cuttings from the outside of the bit pass away more freely, and when breakdown occurs at this point the cause is generally vibration due to lack of proper stabilization, a bent rod or core barrel, sloppy threads, or poor bit design.

Effect of Differing Inside and Outside Speeds

The second consideration is the difference in lineal feet traveled per minute between the outside and inside portions of the bit. In coring bits this difference is not sufficient to cause trouble unless the kerf is very wide and the core to be taken is very small in relation to the full diameter of the bit. In solid bits this difference in lineal speed assumes some importance. If the outside of the bit is running at the correct speed, it follows that the middle is running too slowly. The effect of this will be that the outside cuts itself free, thus imposing an excessive load on the center portion; and the effects of overloading have already been noted. If the center portion of the bit is rotating at the correct speed, the outside will be turning too fast. The diamonds cannot then perform their proper function, and instead of penetrating the rock they will tend to slide over it.

Polishing Impairs Cutting

Two conditions arise from this action according to the quality of the diamonds used and the extent by which the lineal speed is excessive. The diamonds will either break down by a gradual shearing action or else become highly polished so that their cutting action is impaired. They can still exert a crushing action, but this, in turn, means that additional weight must be applied to maintain penetration, or the rotational speed must be decreased; both of which are undesirable. Eventually the passage of cuttings at the periphery will be restricted, causing a breakdown, in greater or lesser degree, at the outside of the bit. In extreme cases, when the flow of water is greatly restricted or completely cut off, sufficient heat will be generated to destroy the diamonds and even melt the matrix metal.

In designing a solid bit, such as is used in blast-hole drilling, it is possible to arrange the concentration of diamonds so that the loads on various parts of the bit face are equalized to a considerable extent, and thus it is possible to overcome the difficulty which arises from the difference in lineal speed between the inner and outer portions of the bit.

Solid Bit's Dead Center a Problem

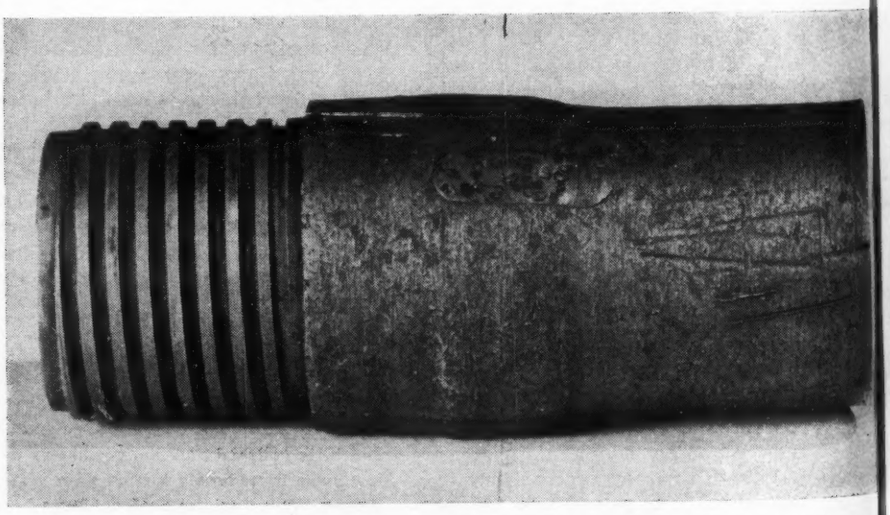
The dead center of a solid bit, however, remains a problem. Manufacturers have attacked this difficulty in various ways, but, theoretically, none have found any final solution. Use of a design that permits taking a small core in the center is merely evading the trouble, although such a design is often effective. An arrangement of selected stones in the center will prolong the bit life considerably and is, in fact, one solution now in fairly general use. When the bit is concave on the face, or towards the center, the diamond concentration over the area covered can be increased, and the greater number of diamond points tend to make up for the reduction of their lineal speed at the center. Eventually, however, these center stones may break down, due to excessive load, and loss of penetration speed will necessarily follow. Recent designs, taking these factors into consideration, have certainly prolonged bit life and consequently lowered footage costs; but further progress can still be made. The art is by no means complete.

Full Power Through Range of Speed Is Desirable

Many of the drills now in use do not attain their full power output until they attain a high revolution rate. Bits are built to suit both the formation they are to cut and also the machine on which they are to be used. When the high revolution factor is constant, the choice of bit design is greatly limited. It therefore follows that machines which maintain full power throughout their speed range are more desirable, in that they can be run at the correct rotational speed for the bit and still maintain the correct pressure on the cutting face. Where homogeneous rocks are being drilled a screw feed arrangement with proper gearing will give excellent results; but where the rock is found to vary in both hardness and abrasive qualities it may be preferable to use a hydraulic or variable feed.

Reaming Shell Stabilizes

Stabilization is of great importance, both to insure a straight hole and to prevent any eccentric action at the cutting face. In conventional core drilling a diamond-set reaming shell is run immediately behind the bit. The main reasons for this are to maintain gage, so that a new bit may follow an old one which has lost gage, without having to ream the hole; and to protect the core barrel; but the stabilizing effect of the shell is of equal importance. The effi-



4. STRIPS OF TUNGSTEN CARBIDE impregnated with diamonds are set in this EX reaming shell. There is little or no clearance over the shell blank, and the metal ahead of the strips has been worn so thin that the shell can no longer be used. Yet only one quarter of the strip has been used up.

ciency of a reaming shell as a stabilizer is greatly enhanced by the use of a hardened ferrule, or diamond-set ring, above the core barrel and of a diameter approximating that of the reaming shell.

This stabilizing function is frequently overlooked in blast-hole drilling, where solid bits are used and no core barrel is necessary, and in particular where one bit will complete a short hole, so that maintenance of gage does not appear to be of paramount importance. In actual fact, stabilization should be maintained in some form in order to keep the bit running truly on its axis. Pilot bits have some stabilization built into the crown, but coring and concave type bits have little or none. In drilling abrasive and friable rocks, it has frequently been found that the wear on the reaming shell has been excessive, and to save cost the shell has been completely discarded. In such cases it would seem that the fault is in the design and type of shell used, and the solution is not to omit the shell, thereby losing the stabilizing effect, but rather to vary the type used until satisfactory performance is achieved. Reaming shells, when functioning efficiently, more than pay their way in saving bit costs.

Clearance for Cuttings Needed in Reaming

The wear on reaming shells is occasioned, obviously, by abrasion; and the factors controlling this, though similar in nature to those controlling bit wear, are much simpler, because only a reaming action is required and the disposal of the cuttings is simplified. One should remember, however, that bit cuttings must also pass the reaming shell, and therefore adequate clearance must be provided. Shells set with vertical strips of diamonds allow far more passage for the bit cuttings than the old-style ring setting. Even so, it occurs frequently that abrasion of the shell blank below the diamond strips causes the shell to wear out long before the strips have lost their gage (See photograph 4). The only cause of this is the inability of the bit cuttings to pass away freely. Turbulence of the stream of water at this point, caused by the rotation of the shell strips, tends to separate the cuttings from the water and, during the lag in their passage towards the surface, they crowd upon each other and eventually start an abrasive action on the shell blank. This condition can usually be avoided by placing at least two of the strips at the bottom of the shell blank, to prevent abrasion at that point, and by increasing the clearance of the diamonds over the shell blank until sufficient passage for the cuttings is provided. Where this is undesirable, water-grooves can be cut, or even flats can be milled, between the shell strips.

The development of bits in which diamonds are impregnated throughout the matrix has been slow. This is largely due to the fact that bits of this type by their very nature cannot exactly conform to the rules which govern surface-set bits. In an impregnated bit it is necessary for the matrix to wear away so that the succeeding layers of diamonds become exposed on the cutting face. It follows, therefore, that the clearance of the diamonds over the matrix varies during use, and so the control of the cuttings and of the volume of water flowing over the face of the bit is lost. Though it might be possible to suit a matrix to any given rock, so that the abrasion of the matrix would keep pace with the diamond wear, this suggestion is not practical because of changes in the formation and the paucity of metals with suitable diamond-holding qualities.

As an alternative, sandblasting is frequently used, thus restoring clearance to the diamonds when their projection is reduced by wear. This is not the ideal solution, but it does enable impregnated bits to be used in formations which are not readily penetrated by surface-set bits. The reason why surface-set bits fail to penetrate these formations efficiently is either that the diamonds polish within a few feet or that the matrix wears away too rapidly. It could be contended that both of the difficulties mentioned stem from lack of control rather than from any inherent lack of cutting quality in the diamonds themselves.

Experiments Under Way

Nevertheless, the need for an efficient diamond-impregnated bit exists, and considerable experimentation is taking place in the United States, Canada, and South Africa. There are obvious advantages in a bit that will wear out completely and which can then be thrown away, thus obviating the necessity of a resetting process. Furthermore, diamonds that are broken in use cannot, in many cases, be reset; but in an impregnated bit they can be completely used up provided that they are held securely in the matrix. This constitutes a considerable saving in cost as well as a conservation of diamonds. With the present increase of diamond drilling and the gradual decrease in the world supply of diamonds this question of conservation should be borne in mind, for it is important. The use of fragmented bortz in impregnated bits will naturally help in this respect and, when free-cutting qualities and adequate penetration speed can be incorporated in the design, this development will be a big factor in the furtherance of appropriate uses for diamond drills.

Shaped Charge Easily Clears Blocked Finger Raise

FROM JOHN F. DUGAN, general superintendent of mines for International Smelting & Refining Co., Salt Lake City, Utah, come interesting details as to the effectiveness of a single 13-stick shaped charge on May 20 last in breaking up a bad hang-up in a finger raise in the property of National Tunnel & Mines Co., International's subsidiary at Tooele, Utah. In this finger, which delivers to the scram drift in the west end of Block 3, a very large slab hung high, blocking the flow of ore. The day before, the slusher operator had used successively two heavy charges, each a standard bomb bundle, one of 20 sticks and the other of 40 sticks, but without results, the slab not even being cracked.

At noon on May 20 the 13-stick shaped charge was placed by the blaster on the exposed underside of the slab in its exact center. The ensuing blast pulverized one half of the hung boulder (4 x 6 x 5 ft.) and brought it down into the scram drift. The other half remained in the finger but was thoroughly cracked and ready to come down. W. T. Warren, general superintendent for the National Tunnel company, reports that the results that were thus obtained were 100 percent effective.

Vistas of Mexican Mining—I

EVAN JUST, Editor

Pachuca—King of Silver Producers

THE PACHUCA-REAL DEL MONTE district, whose total production of silver is unrivaled, is generally viewed as on its last legs. Two of its three producers are in the hands of cooperatives, the Dos Carlos and the San Rafael, which lead a precarious existence. Both are deeply in debt and require Government assistance from time to time. The largest producer, Cia. de Real del Monte y Pachuca, U. S. Smelting, Refining and Mining Co. affiliate, still struggles on, striving to stay in existence despite crippling tax burdens and labor difficulties that hamper efficiency and make thoroughgoing exploration infeasible. Were labor willing to cooperate effectively toward improving efficiency and were taxes less onerous, the management believes it could carry on for a long time. It is reasonably certain that the district contains many undiscovered orebodies, but with the present outlook exploration is necessarily inadequate.

A Network of Veins

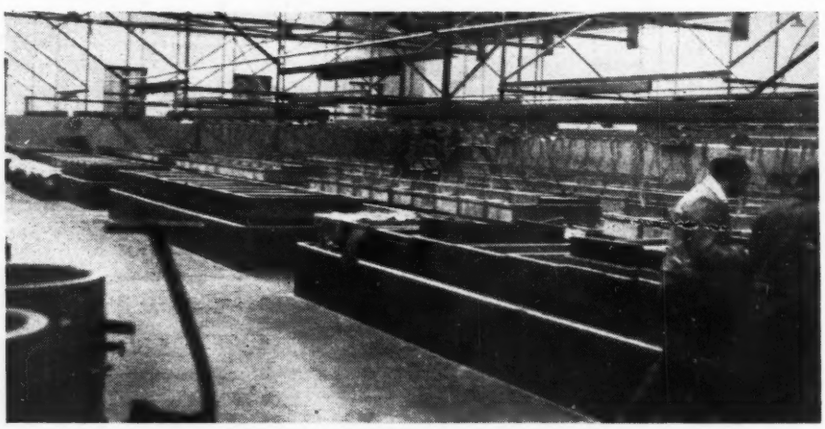
The district measures ten kilometers east-west and eight kilometers, north-south. All the orebodies are veins, up to eight meters wide, in Tertiary andesite. Ore shoots are quite persistent. The area is traversed east-west by the large Viscaina fault, but the veins are principally along lesser faults, mainly north-south in the Real del Monte area and east-west in the Pachuca area. The former area comprises the eastern end of the district and the latter the western. They are separated by a barren zone two kilometers wide.

Prospecting is done mainly with horizontal diamond-drill holes, sometimes as much as 1000 m. in length. The holes tend to drift toward vertical. Therefore they are inclined upward at the start, from 10 to 15 degrees in the longer ones, to keep an average horizontal position.

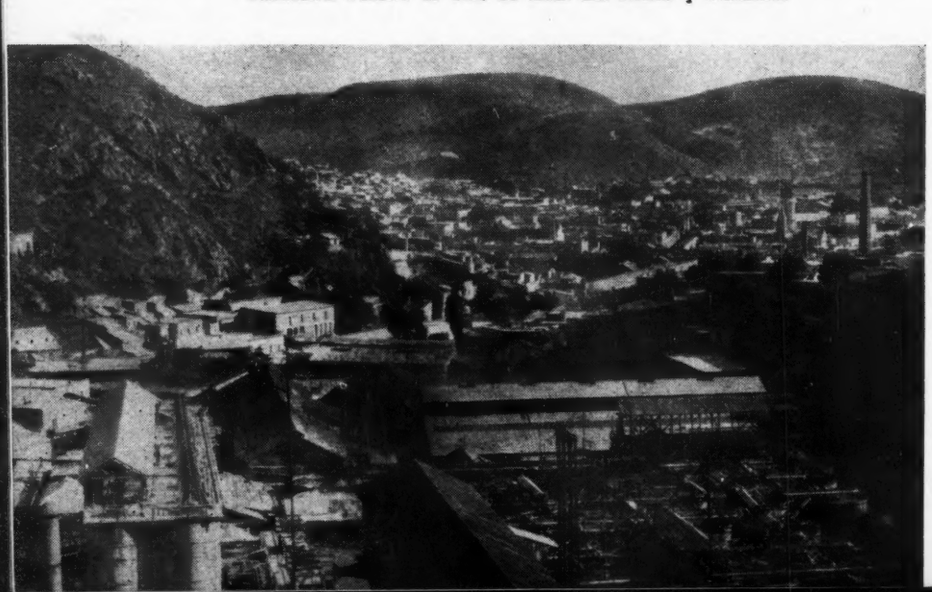
In the Real del Monte operations, stoping is about equally shrinkage, cut-and-fill, and square-set. Nearly all underground work is on a contract or incentive-wage basis, either a fixed rate for a given job, or incentive wages for tonnage in stoping, or footage in drifting. In contract work, the contractor bosses get a fixed percentage of total payments. In incentive-wage contracts, company employees are used and the company guarantees a minimum per diem. The number employed by Real del Monte is 5200, some 3500 being underground workmen.

The Loreto cyanide mill of Real del Monte has a capacity of 115,000 metric tons per month. Eighty-five percent of this is newly-mined ore, the remainder being old-dump material. The mill recovers 89 percent of the silver values and 91.5 percent of the gold.

Real del Monte is equipped, not only with its own refinery and parting plant, but with unusually complete shops, where most of the company's equipment is made and repaired. The shops even include a precision machine shop, where the company makes its own rock drills.



PARTING PLANT of Cia. de Real del Monte y Pachuca.



LORETO MILL: Pachuca in background.

Zacatecas' Big Producer

AT FRESNILLO, in the State of Zacatecas, the Fresnillo Co. mines and mills 200 metric tons of ore per day averaging five percent zinc, four percent lead, 0.5 percent copper, and 300 grams of silver and 0.8 gram of gold per ton.

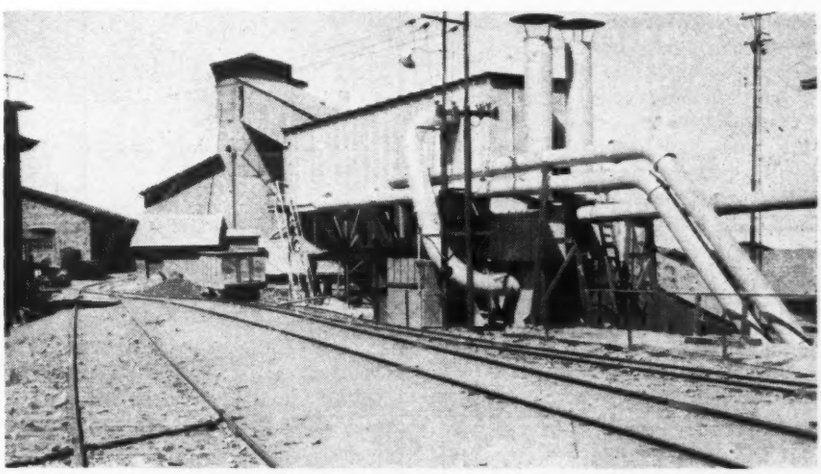
The ores are in a system of veins, the principal ones trending N. 35 deg. W., with a secondary east-west series. Dips are between vertical and 50 deg. Faults are rare. Veins are rarely more than one meter in thickness. The country rock is Tertiary tuff and breccia at the surface, and underlain by Mesozoic shale, argillite, graywacke and shaly limestone. Ore minerals are galena, marmatite, chalcopyrite, pyrite, and silver sulphides, principally pyrargyrite. Gangue is principally quartz, with some calcite, barite, and silicates. There are two types of ore. The "light sulphide," occurring principally above 1000 feet in depth, is high in silver (500-600 grams) but low in lead, zinc, and copper. The deeper, "heavy sulphide" ore is lower in silver (200-300 grams) but higher in zinc (5½ percent), lead (4½ percent), and copper (0.6 percent). This composes two-thirds of the millfeed.

Ore is hoisted through two shafts (General and Saraos). Underground, the South shaft and two winzes are also used for hoisting. The Buenos Aires shaft is used largely for men and supplies.[1]

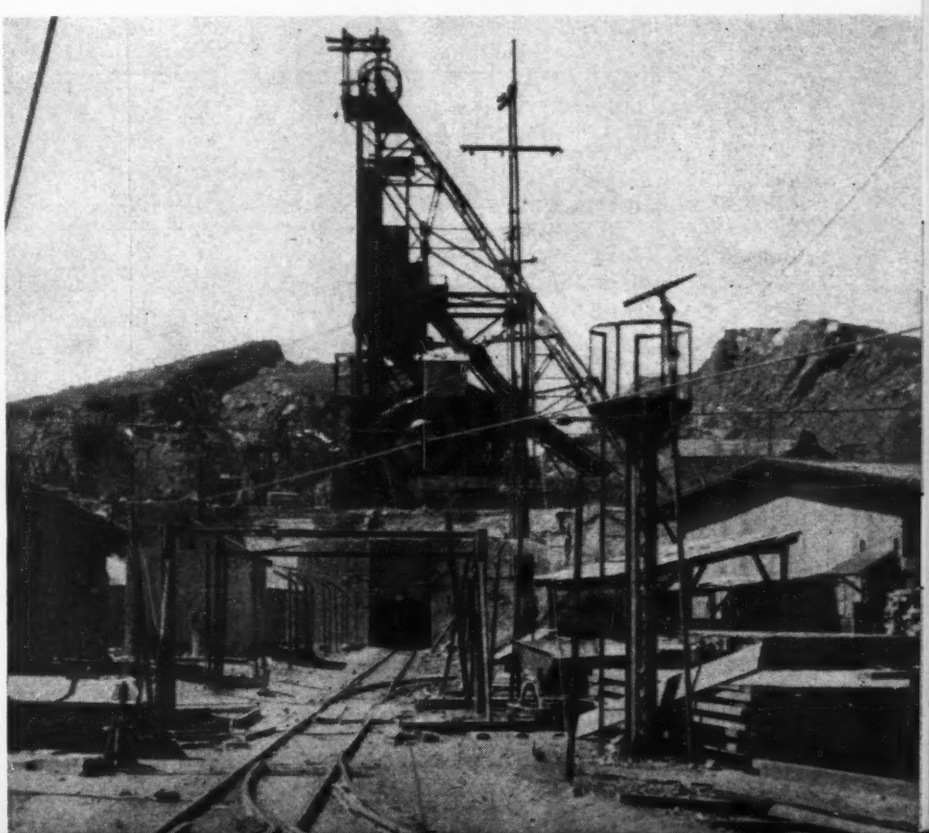
Mining is done by underhand stoping. The levels are 45 meters apart and stopes are 60 meters long. After an initial raise is driven through the center of a stope block, stoping is done by carrying benches six feet wide downward in pairs, the face nearest the stope being slightly lower so that mucking into the stope will be as easy as possible. After a pair of faces is advanced to the bottom of a stope, another pair is begun from the top. No pillars are left between stopes, ground support being dependent on 2 to 3 meters of floor left below each level and about one meter of back above. Drilling is done principally with jack-hammers. The mine workings are quite warm in the lower levels. The present bottom is 3165 feet deep.

The mill is a 2500-ton (metric) flotation plant. The light and heavy sulphide ores are handled separately throughout. The ores are ground to 60 percent minus 200 mesh. Pulp is thickened to 42 percent solids after grinding in order to maximize capacity. By flotation, five types of concentrates are made. These are (1) zinc; (2) iron; (3) low-grade (cupriferous) lead, from light sulphide ore; (4) high-grade lead; and (5) copper. The last two are separated (using sodium dichromate to depress lead) from a lead-copper concentrate made from heavy sulphide ore.

Fresnillo installed aluminum therapy in its change houses as a silicosis preventive. However, after a trial, it was discontinued except for supervisors, principally because the workmen feared that any statutory disability would be concealed and they might lose their rights to compensation!



NORBLO DUST COLLECTOR for crushing plant, Fresnillo.



GENERAL SHAFT, Fresnillo. Glory hole cut in background.

[1]For detailed descriptions of the Fresnillo operation, see E. & M. J., Apr. 1936, pp. 184-188 "Extensive Operations in Zacatecas Center at Fresnillo," by A. H. Hubbell, and E. & M. J., June 1936, pp. 279-284, "Mining Sulphide Ore at Fresnillo," by J. H. Ashley.

Ancient Taxco Now a Base-Metal Camp

IN 1940 the only going operation in the picturesque old mining camp of Taxco was the Pedregal mine, operated by Cia. Minera Pedregal y Anexas, with its headframe and 60-ton cyanide plant sitting on a hill overlooking the town and the ruins of the old smelter.

Taxco is one of the oldest mining camps in Mexico, if not the oldest, having been mined before the Spanish conquest. The Spaniards mined silver at Taxco, and the vein outcrops throughout the camp are scarred with their old workings. The Taxco veins carry zinc and lead, particularly below the zone of oxidation, but base metals had never been profitably mined.

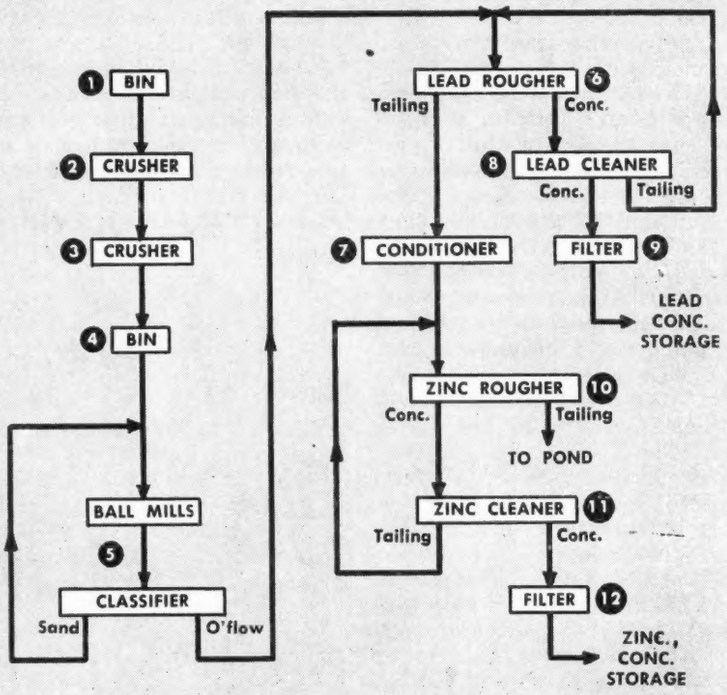
In 1940 the Eagle-Picher Mining & Smelting Co. started development on a group of four veins a few miles west of the town. The largest vein, the Babilonia, has a maximum width of 13 meters. In 1942 the company organized a Mexican affiliate, Minas de Guerrero, S.A., and built a 750-ton flotation mill. This mill was started in 1943 and is now handling 20,000 tons per month of zinc-lead-silver ore, the values being primarily in the base metals.

In 1942 A. S. & R. acquired the Jesus mine a few miles farther west and the Pedregal property, then converted the Pedregal mill into a flotation plant to handle base-metal ores. This mill, of 275 tons' capacity, handles ore from the Jesus mine and from the sulphide zone in the Pedregal mine.

The Taxco veins occur in shale and an underlying limestone up to 100 meters in thickness, of Cretaceous age. Stratigraphically below the limestone is schist. All formations have steep dips. Where the veins pass into schist the ores, in so far as known, pinch out. On the basis of the depth of the schist, of the three mines mentioned, the Jesus seems to be best situated for a long life ahead.

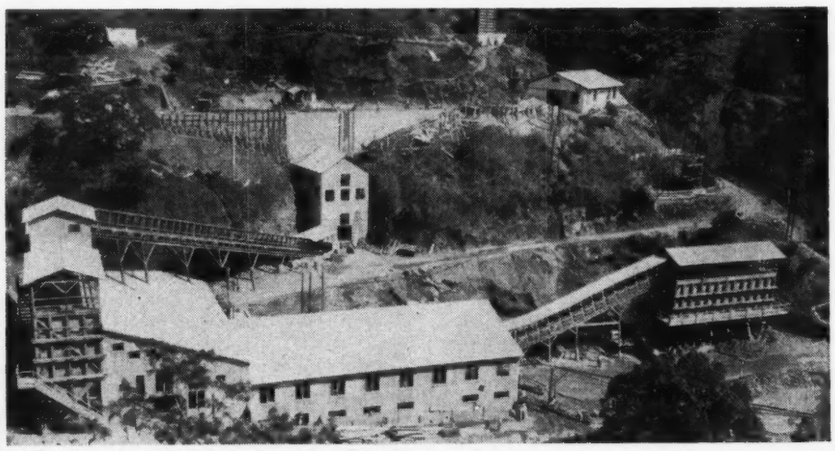
Zinc concentrates from Taxco, being non-marmatitic, bring a better price than most Mexican zinc concentrates.

TAXCO PLANT—MINAS DE GUERRERO



LEGEND

1. Coarse ore storage.
2. Jaw crusher, 24x14-in.
3. Symons short-head cone, 3-ft.
4. Fine ore storage.
5. Two Marcy No. 75 mills in parallel, each with Morse classifier, 5x24-ft.
6. Fagergren cells, six No. 66.
7. Two Denver conditioners, 12x14-ft.
8. Denver cells, six No. 18.
9. American filter, 4-disk, 6-ft.
10. Fagergren cells, six No. 66.
11. Fagergren cells, six No. 66.
12. American filter, five 3-disk, 6-ft.



MINAS DE GUERRERO MILL at Taxco. Upper right, compressor house; center, crushing plant; left, grinding plant; lower center, flotation plant; lower right, concentrate storage and loading hopper.

Ingenious Devices Reflect Interest in Mine Safety

ERIC RUNEHJELM, Safety Director, Hudson Bay Mining & Smelting Co., Flin Flon, Man.

AFTER the Hudson Bay Mining & Smelting Co. had opened up its underground property at Flin Flon, in northern Manitoba, in the early 30's, sufficiently for it to begin mining, it soon found it necessary to provide safety belts and ropes for the men engaged in the underhand sublevel stoping which had been adopted as the mining method. After experimentation with different materials and styles, it finally, in 1935, developed the belt shown, which is the one now used.

The belt consists of a length of the best plough-steel cable, galvanized and ¼ in. in diameter, attached by leather loops to a leather belt 3 in. wide and ⅛ in. thick. The connection between the two ends of the cable is made up of a snap hook and an oval-shaped eye. These are so made that the cable can be socketed to the connections with molten zinc. Under test, the wire rope thus connected finally failed under tension at 6780 lb. The belt connection is made by Carl Hansen, of Winnipeg.

The D link shown, through which the safety rope runs, is so attached to the belt that the steel cable also passes through it. Between link and leather there is a piece of heavy copper sheeting covered by another piece of leather.

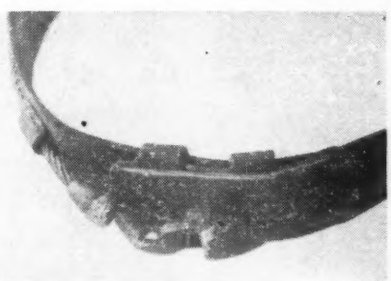
When electric cap lamps were adopted, a strap was added for carrying the battery. The cable was first covered with a piece of leather 3 in. wide and about 7 in. long and then the battery strap itself, with its buckle, of a size to fit the loops on the battery case, was attached.

The weight of the belt assembly complete is approximately 4 lb.

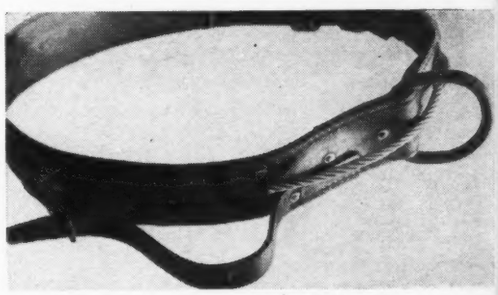
Hat for Shaft Work

Another improvement at Flin Flon, which is intended to promote safety during shaft inspection, is the hard-boiled hat shown, the crown of which has been covered outside and inside with sheet rubber from the top part way down. This development owes its origin to an accident to a shaft inspector who was hit on the hat by a rock which knocked him down on the landing on which he was standing. Upon examination, the crown of the hat was found to have been broken as well as the wire screen embedded in it. But for the jagged edges of the broken crown, which had lacerated the inspector's scalp, he would have suffered no injury at all. The safety department therefore dressed the outside and the inside of the crown with sheet rubber 1/16 in. thick. Shaft inspectors have since been required to wear such hats when on the job.

Along the rim of the hat also a rubber band was applied, glued on, about ½ in. wide and ⅛ in. thick with a few grooves cut for the water to drain through. Chin straps were added, but these did not meet the approval of some inspectors and so were discarded. The miners have a great deal of confidence in this arrangement.

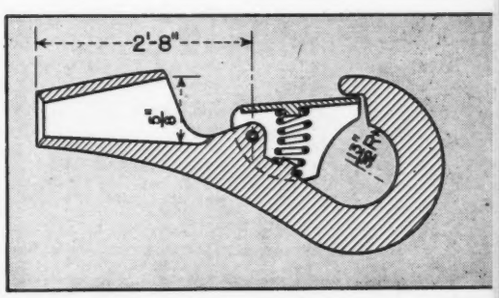


FRONT OF BELT, showing the snap and the socket engaged

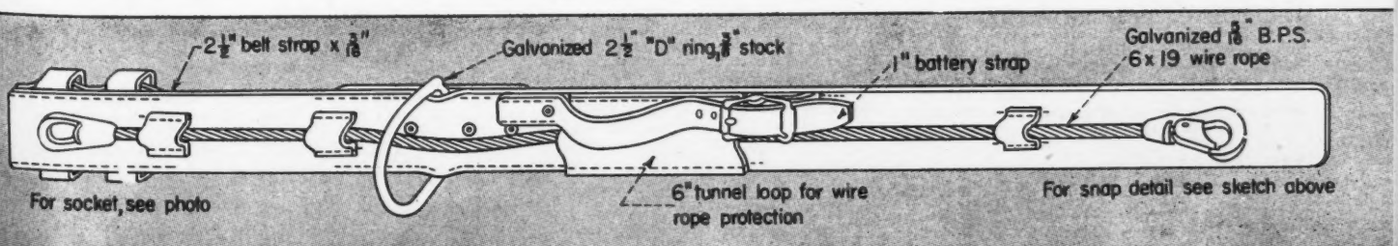


BATTERY STRAP, D link, and wire cable and the back and side of the belt

HARD-BOILED HAT, having rubber-covered crown and rim



CROSS SECTION OF SNAP, showing keeper and its spring


2½" belt strap x 3/16"
Galvanized 2½" "D" ring, ⅜" stock
1" battery strap
Galvanized 3/16" B.P.S. 6 x 19 wire rope
For socket, see photo
6" tunnel loop for wire rope protection
For snap detail see sketch above

FLIN FLON MINE SAFETY BELT, *(below)*, in isometric sketch. The size shown is 38 in., the overall belt length being 44½ in. and the rope length when snapped 41 in. These belts are made in even and odd sizes, 32 to 48 in. Using the fittings illustrated the wire rope is cut the same length as the belt size

MARKET SUMMARY

THOSE IDENTIFIED WITH the non-ferrous metals industry who expected that, under the new law extending price control for another year, OPA would take a realistic view of pricing metals in short supply were disappointed. Throughout August the ceiling price of lead continued at 8.25c., New York, and of Prime Western zinc at 8.25c., St. Louis. In holding to these levels, the flow of both metals to consumers desperately in need of supplies was checked. Metal accumulated at higher prices in July could not be sold at above-ceiling levels. Moreover, in the case of lead, dealers and others concerned with handling secondary material refrained from marketing their metal simply because they were convinced that it was worth more under prevailing conditions.

Late in August, the Civilian Production Administration, in an attempt to break the deadlock in lead, announced that no increase in the current ceiling price of lead or scrap lead is planned in the foreseeable future. This statement was accepted in market circles as additional proof that those charged with regulating prices possessed little knowledge of how markets really operate. The Government actually purchased foreign lead during the month on the basis of 9½c. per pound, United States ports (22,500 tons for third-quarter delivery), and business was booked in the export market late in August as high as 10¼c. per pound.

With producers reluctant to part with zinc on the basis of 8¼c., East St. Louis, the authorities in Washington also refrained from releasing metal, and consumers experienced difficulty in maintaining manufacturing operations. On Aug. 26, however, CPA altered its stand and released a limited tonnage of Regular High Grade from the stockpile. This action was necessary, it was said, because some producers have withdrawn from the market. It was doubtful whether consumers other than brass makers would take advantage of the offer. The stockpile of slab zinc on Aug. 22 contained 202,685 tons, of which 141,866 tons was Regular High Grade. An upward revision in the zinc ceiling was viewed as probable.

Actual consumption of refined copper by fabricators in the first seven months of 1946 averaged 87,815 tons a month. This high rate was attained

Major Metals

U. S. DAILY AND AVERAGE PRICES

1946 Aug.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: East St. Louis
1	14.150	15.925	52.000	8.25	8.10	8.25
2	14.150	15.925	52.000	8.25	8.10	8.25
3	14.150	15.925	52.000	8.25	8.10	8.25
5	14.150	15.925	52.000	8.25	8.10	8.25
6	14.150	15.925	52.000	8.25	8.10	8.25
7	14.150	15.925	52.000	8.25	8.10	8.25
8	14.150	15.925	52.000	8.25	8.10	8.25
9	14.150	16.050	52.000	8.25	8.10	8.25
10	14.150	16.050	52.000	8.25	8.10	8.25
12	14.150	16.075	52.000	8.25	8.10	8.25
13	14.150	16.025	52.000	8.25	8.10	8.25
14	14.150	16.125	52.000	8.25	8.10	8.25
15	14.150	16.150	52.000	8.25	8.10	8.25
16	14.150	15.950	52.000	8.25	8.10	8.25
17	14.150	15.950	52.000	8.25	8.10	8.25
19	14.150	16.175	52.000	8.25	8.10	8.25
20	14.150	16.175	52.000	8.25	8.10	8.25
21	14.150	16.175	52.000	8.25	8.10	8.25
22	14.150	16.175	52.000	8.25	8.10	8.25
23	14.150	16.225	52.000	8.25	8.10	8.25
24	14.150	16.175	52.000	8.25	8.10	8.25
26	14.150	16.225	52.000	8.25	8.10	8.25
27	14.150	16.250	52.000	8.25	8.10	8.25
28	14.150	16.250	52.000	8.25	8.10	8.25
29	14.150	16.175	52.000	8.25	8.10	8.25
30	14.150	16.300	52.000	8.25	8.10	8.25
31	14.150	16.300	52.000	8.25	8.10	8.25
AVERAGES FOR MONTH						
Aug.	14.150	16.091	52.000	8.25	8.10	8.25
AVERAGES FOR WEEK						
7	14.150	15.925	52.000	8.25	8.10	8.25
14	14.150	16.042	52.000	8.25	8.10	8.25
21	14.150	16.096	52.000	8.25	8.10	8.25
28	14.150	16.217	52.000	8.25	8.10	8.25
CALENDAR WEEK AVERAGES						
Aug. 3	14.150	15.925	52.000	8.25	8.10	8.25
10	14.150	15.967	52.000	8.25	8.10	8.25
17	14.150	16.046	52.000	8.25	8.10	8.25
24	14.150	16.183	52.000	8.25	8.10	8.25
31	14.150	16.250	52.000	8.25	8.10	8.25

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(*a*) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(*b*) Effective March 14, our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead are for common lead.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1946 Aug.	Sterling Exchange: "Checks"	Silver (c): New York	Silver (c): London	Gold: London	Gold (d): United States
1	403.250	90.125	44d.	172s. 3d.	$35.000
2	403.250	90.125	44d.	172s. 3d.	$5.000
3	(e)	(e)	(e)	(e)	35.000
5	403.250	90.125	Holiday	Holiday	35.000
6	403.250	90.125	55½d.	172s. 3d.	35.000
7	403.250	90.125	55½d.	172s. 3d.	35.000
8	403.250	90.125	55½d.	172s. 3d.	35.000
9	403.250	90.125	55½d.	172s. 3d.	35.000
10	(e)	(e)	(e)	(e)	35.000
12	403.250	90.125	55½d.	172s. 3d.	35.000
13	403.250	90.125	55½d.	172s. 3d.	35.000
14	403.250	90.125	55½d.	172s. 3d.	35.000
15	403.250	90.125	55½d.	172s. 3d.	35.000
16	403.250	90.125	55½d.	172s. 3d.	35.000
17	(e)	(e)	(e)	(e)	35.000
19	403.250	90.125	55½d.	172s. 3d.	35.000
20	403.250	90.125	55½d.	172s. 3d.	35.000
21	403.250	90.125	55½d.	172s. 3d.	35.000
22	403.250	90.125	55½d.	172s. 3d.	35.000
23	403.250	90.125	55½d.	172s. 3d.	35.000
24	(e)	(e)	(e)	(e)	35.000
26	403.250	90.125	55½d.	172s. 3d.	35.000
27	403.250	90.125	55½d.	172s. 3d.	35.000
28	403.250	90.125	55½d.	172s. 3d.	35.000
29	403.250	90.125	55½d.	172s. 3d.	35.000
30	403.250	90.125	55½d.	172s. 3d.	35.000
31	(e)	(e)	(e)	(e)	35.000
AVERAGES FOR MONTH					
Aug.	403.250	90.125	54.405	—	35.000
AVERAGES FOR WEEK					
7	403.250	90.125	—	—	—
14	403.250	90.125	—	—	—
21	403.250	90.125	—	—	—
28	403.250	90.125	—	—	—

Calendar week averages, New York Silver: Aug. 3rd, 90.125; 10th, 90.125; 17th, 90.125; 24th, 90.125; 31st, 90.125.

(*e*) Not quoted (Saturday).

(*c*) Determined by Handy & Harman on the basis of market prices for bar silver, in cents per troy ounce .999 fine, in amounts of 50,000 oz. or more, nearby delivery, New York. In addition to foreign silver, the quotation also applies to domestic and Treasury silver if such silver enters into the market.

The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July, 1946.

London silver in pence per troy ounce, basis .999 fine.

(*d*) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

in spite of labor difficulties. Demands are certain to rise over the remainder of the year, and a comfortable demand-supply picture is not expected. Heavy imports will be necessary to meet the demands. The ceiling here continued at 14⅜c., Valley. The Government purchased more than 40,000 tons of foreign copper for third-quarter delivery, paying as high as 16¼c., United States ports. Late in August, copper sold in the foreign market on the basis of 16½c., f.a.s. New York. A strike at Rhodesian properties has been settled.

Importations of silver have increased and consumers have been able to satisfy their immediate wants without bidding for Treasury silver. Unpledged Treasury silver would have to sell at slightly more than the prevailing New York basis to release metal from the Government's supply.

NOTE—Export copper, f.o.b. refinery, for June was 14.430.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for July and August:

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

	July	Aug.
Quicksilver, N. Y. flask	98,308	97.556
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b)	16.500	16.500
Platinum, oz. troy	67.000	78.556
Cadmium (c)	118.269	125.000
Cadmium (d)	120.769	127.500
Cadmium (e)	123.269	130.000
Aluminum ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1937	90.86
1930	82.87	1938	73.67
1931	60.20	1939	77.71
1932	48.26	1940	79.22
1933	59.79	1941	83.49
1934	65.59	1942	86.80
1935	74.66	1943	88.74
1936	73.45	1944	88.74
		1945	90.86

	1944	1945	1946
January	88.74	88.74	96.42
February	88.74	88.74	96.42
March	88.74	88.74	96.42
April	88.74	88.74	96.42
May	88.74	88.74	96.42
June	88.74	88.74	107.16
July	88.74	88.74	117.11
August	88.74	88.74	113.32
September	88.74	91.16	....
October	88.74	96.40	....
November	88.74	96.42	....
December	88.74	96.42	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

MISCELLANEOUS METALS

(August 31, 1946)

Aluminum, ingot, 99 plus percent, lb.	15c.
Antimony, domestic, spot, lb., 5 tons or more	15.839c.
Bismuth, ton lots, lb.	$1.60
Cadmium, commercial sticks, lb.	$1.25
Calcium, lb. ton lots, 97 @ 98 percent, cast	$1.85
Chromium, 97 percent grade, lb.	89c.
Cobalt, 97 to 99 percent, per lb.	$1.50
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb.	35c.
Magnesium, 99.8 percent, carloads, lb.	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$80.00
Quicksilver, flask of 76 lb., 25 flasks or more	$96.00
Selenium, 99.5 percent, lb.	$1.75
Silicon, minimum 97 percent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.	$17.50
Titanium, 96 to 98 percent, lb.	$5.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$8.00@$10.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio (Prices nominal)	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$5.45
Mesabi bessemer	$5.20
Old Range non-bessemer	$5.30
Mesabi, non-bessemer	$5.05
Lead (Galena) 80 percent, Joplin, Mo., ton	$99.90
Manganese, Metals Reserve Co. sales price, per long-ton unit of Mn contained, 48 percent, subject to premiums and penalties, effective May 15, 1944: 85c. (duty paid) New York, Philadelphia, Baltimore, Norfolk, Mobile, and New Orleans; 91c., Fontana, Calif., Provo, Utah, and Pueblo, Colo. (Current prices in open market nominal at 73@75c. per long-ton unit.)	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 60 percent, duty paid	$24.00
Domestic, scheelite, 60 percent and upward	$24.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$50.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots	5c.
Cobalt Oxide, 70 to 71 percent, lb.	$1.06
Copper Sulphate, 100 lb.	$5.65

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$14.75
Ferrochrome, 65 to 70 percent per lb. of Cr contained	13c.
Ferromanganese, 78 to 82 percent, gross ton	$135.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo contained	95c.
Ferrosilicon, 50 percent, per lb. of contained Si	6.60@8.10c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V delivered	$2.70@$2.90
Silicomanganese, 1 percent C, gross ton	$138.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U.S funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$8.50@$9.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$8.25@$8.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$5.00
Domestic, chemical, 55 to 58 percent	$7.50@$8.50
Domestic, abrasive, 80 to 84 percent	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 60 percent, all rail movement, ton	$30.00
Acid 98 and 1 percent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica: Domestic producers quote on punch and sheet as follows: Punch, 22c. per pound; 1½x2 inch, $1.10; 2x2 inch, $1.60; 2x3 inch, $2.10; 3x3 inch, $2.75; 3x4 inch, $3.50; 3x5 inch, $4; 4x6 inch, $5. Wet ground, very fine, $90 per ton. Special grades command premium. Bulk sales dry ground, $32.50 per ton. Scrap, $28 per ton and up.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c i f. Atlantic ports	12c. nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$28.00
Steel, base price, Pittsburgh Billets, gross ton	$39.00
Structural shapes, 100 lb.	$2.35

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Public Lands Withdrawal Scored by Sen. McCarran

A battle, which is to be continued in the next session of Congress, to secure legislation for controlling the withdrawal of public lands from settlement, entry, location, and sale, has been formally opened by Senator McCarran, of Nevada. In a recent speech he made several strong statements that reflect the Western attitude on "land grabbing" by Government agencies. His first point was: "The power to make Executive withdrawals of public lands has been abused with utter abandon. Withdrawal orders are issued in great numbers, on the flimsiest of excuses, and with little or no regard for their effect upon the interests and the means of livelihood of the citizens of the Western states, or upon the development of the resources therein. Most of the withdrawals are made at the behest of administrative agencies which are striving to expand their prestige and bureaucratic control. The numbers of these withdrawals run into many thousands and are so numerous and so confused and conflicting that the General Land Office [Bureau of Land Management] cannot give even an approximate estimate of the number now outstanding. They became so numerous and so burdensome for the President to sign that four years ago Roosevelt delegated to Secretary Ickes full authority to issue and revoke all withdrawal orders, with the approval of the Bureau of the Budget and the Attorney General."

A large proportion of the withdrawals are designated in the orders as "temporary," the Senator pointed out. It is rare for a tract temporarily withdrawn ever to be reduced in area. Withdrawals are rarely vacated. "So-called temporary withdrawals issued as early as 1862 are still in full force and effect," he said.

Senator McCarran's subcommittee on public lands found that many withdrawal orders were prepared and issued in a very irregular manner, in violation of the law and the regulations. The Senator stated: "In all cases that have come to my knowledge, the orders have been prepared and issued in entire secrecy, without consultation with, or the knowledge of, the members of the Congress or the officials or citizens of the states concerned."

In response to a question from Senator Murdock, of Utah, Senator McCarran said it was true that withdrawals have been used as a weapon in forcing through the legislative bodies laws which various Governmental agencies wanted passed. Senator Murdock added that one of a series of withdrawals made by the Bureau of Indian Affairs involved about a million acres of land, "and since 1932 or 1934 the Bureau has constantly used that circumstance in an attempt to force through Congress legislation which should never be enacted and will not be enacted."

Little public land remains in the Western states which is not now covered by at least one withdrawal, Senator McCarran said, and much of the land is encumbered by additional overlying and overlapping withdrawals.

More than half of the total land area in the 11 Western states is federally owned. In three of these states, the percentage is over 70, reaching 87 percent in Nevada. If Alaska's area be added to that of the 48 states, it appears that 36 percent of the total land area is owned and administered by the Federal Government in Washington.

Many Mineral Products Released From Control

Several non-ferrous metals, numerous non-metallic minerals, and a group of miscellaneous metal products have been freed from price control under Amendment 36 to Supplementary Order 129, OPA, effective July 26. No price rise is expected on most of the items covered by the order, and some of the non-ferrous metals and their products have already been given price increases or are in line for them, so as to improve production.

Included in items decontrolled are the following:

Arsenic trioxide (crude and refined); cadmium oxide and cadmium sulphite; metallic arsenic; bismuth metal and alloys; cadmium metal; andalusite; aplite; ball clay; barite; bentonite; bleaching clay; bulk chalk; celestite; china clay; cryolite; diatomaceous earth; drilling mud; dumortierite; feldspar; flint; fuller's earth; garnet; gilsonite; graphite; graphite crucibles, stoppers, retorts, and similar graphite products for use in foundries; greensand; halloysite; Iceland spar; ilmenite; industrial diamonds; kaolin; kieselguhr; kyanite; mineral fillers; mullite; nepheline syenite; olivine; paper clay; pumice; pumicite; pyrites; quartz (excluding optical and radio grades); quartz and flint pebbles; rottenstone; rutile; sepiolite; slate flour; slip clay; stoneware clay; strontianite; topaz; tripoli; vermiculite; volcanic ash; whiting; and witherite.

Controls Lifted From Many Mining Machinery Items

Virtually all mining machinery has been removed from price control by OPA, in what is its second important suspension with respect to capital goods. The first action, taken in April 1946, pertained to products having an estimated annual sales value of about $3,500,000,000. The new order covers about $2,000,000,000 worth of products. Items in the latter list are subject to re-control if prices rise unduly.

In addition to most mining machinery, this second action covers electrical equipment, virtually all heavy and many automatic machine tools, many processing machine types, and a wide variety of miscellaneous equipment.

CPA is continuing to give assistance to manufacturers of mining machinery. Most of this is still on the critical list and will remain there for a while. Officials point out that these manufacturers were "snowed under" with orders during the war and have never caught up. Thus they should have their hands full for a long time to come.

Mining equipment decontrolled includes the following: shuttle cars; drills, hand, post, wheel and crawler-mounted; hoists, including tugger, slope shaft, room and mine-car spotters; mine loaders, miscellaneous machinery especially designed for use in mines and sold exclusively to mines; pulverizers; assaying and testing equipment; bag-filling machines; buckets, skips, and cages; car loaders; mine-car dumpers; giants; grizzlies; lamps, mine doors; safety equipment; timber-setting machines; underground fire trucks; ore bridges; power-transmission equipment; industrial, including only the following: belt-tighteners; blocks and bearing housings; brackets; hangers; pillow blocks; shifters; pumps, power-operated; when sold with or without a power unit, as follows: pumps, steam, direct-acting, reciprocating, steam and water cylinders integrally mounted, any capacity at any head; pumps, reciprocating, power-operated other than steam, capacities in excess of 100 g.p.m. or working pressures in excess of 250 p.s.i.; refrigeration equipment condensing units; screening machinery; separators, steam, industrial and marine; settings, refractory-lined, including soaked-pit covers, especially engineered, designed and sold for use in or with furnaces, heaters, heat exchangers, boilers, incinerators, and oil stills used for industrial processing purposes only.

Industry Must Furnish Data For Basing Price Increases

Industry will not be required to "jump through hoops of red tape" to obtain price readjustments, and the time has come when such stories must be vigorously denied and the facts presented, according to Paul A. Porter, price administrator.

"The OPA is determined to follow the letter and the spirit of the law," he said, adding that "the agency has now settled down and is going full-steam ahead to carry out the provisions of the act. Our price people have been given orders to use every means posible to expedite the granting of legal price adjustments. If production is slowed up, it will certainly not be the fault of OPA."

In a prepared statement, Porter said: "We subscribe fully to Congress' statement in the preamble of the act that 'adequate prices are necessary stimulants to production' and also to the statement that we need price control 'for the prevention of inflation and for the achievement of a reasonable stability in the general level of prices and rents, costs of living, and costs of production.'

"The OPA will continue of its own accord to make prompt price adjustments under the general earnings standards which are still authorized under the law. This means, for instance, that when an industry's earnings fall below the minimum set forth in the law, price increases will be allowed. OPA will also remove price controls from non-agricultural commodities which are not important to business or living costs and when supply and demand have come into balance, as required by the new statute.

"An additional set of price standards has also been provided for producing, manufacturing, and processing industries under the new law," Porter pointed out, adding that the law clearly defines the standards by which price adjustments are to be granted, and that they are to be the rule by which the agency will grant adjustments.

"The law states specifically that industry advisory committees must provide cost and price figures to OPA, and that increases can be granted only after such data have been made available. Obviously, you can't reach into a hat and pull out cost data for an entire industry. Such information can come only from industry itself. It won't be easy, I know, for industry to provide this information, but the law requires it and OPA must have it in order to grant legal adjustments. After comprehensive figures come in, they will be carefully analyzed and legal adjustments granted as speedily as possible.

"Though the law gives a limit of 60 days, I am certain that if industry provides all necessary information, in a large number of cases results will be available before the 60-day deadline. However, business itself well knows that analysis of cost data is not a sleight-of-hand trick—it is a job that takes careful, methodical calculation."

All Domestic Zinc Mines Eligible for Premiums

Zinc mines which started operations after Oct. 27, 1943, are now eligible for the same premium payments as old producers, the CPA has announced. This move to place all domestic zinc mines on the same eligibility basis was made by relaxing the restrictions of the Premium Price Plan for copper, lead, and zinc, effective Sept. 1.

Under the plan all zinc-mine production now will be eligible for A, B, and C production quotas. Previously, zinc producers who started operations after Oct. 27, 1943, were not permitted to participate in the B and C quotas.

The notice to the mine producers follows: "The Civilian Production Administration has issued a statement rescinding instructions of Oct. 26, 1943 (WPB-4496), and Nov. 17, 1943 (WLB-LD-59), which restricted the eligibility of new lead and zinc mines to quotas within the A range of the Premium Price Plan. On Feb. 19, 1946, the CPA removed the restrictions on new lead and lead-zinc mines and today's action now removes restrictions on old zinc mines and places all new lead and zinc mines on the same basis as the old producers. This change is effective Sept. 1."

Purchase of Foreign Metals By Government Resumed

The Government's program of imports for scarce metals, mainly copper and lead, endangered by the wording of Sec. 6(A)-4 of the new OPA law, will continue under an interpretation of the section by OPA and OWMR.

Although the section states that "no purchase and sale operation shall be undertaken which will increase the rate of subsidy paid or the rate of loss incurred with respect to any commodity above that which would be paid or incurred if the operation in effect on June 29, 1946, had been continued on the same basis," John R. Steelman, head of OWMR, has ordered that the foreign buying program continue "for the national benefit."

Steelman and OPA contend that the dollar amount of the loss for the imports program was not fixed by the operations prior to June 29, and that there was no basis on which the import losses could be fixed. The program expenditures prior to June 29 were based on the difference between the domestic ceiling price on the commodity and the cost of the import as landed on an American dock. This difference fluctuated with the world market, and, at the end of June, RFC's Metals Reserve Co. was making money on its import program.

Officials point out that so long as there is a fluctuating world price there is no way of knowing from one quarter to another whether the dollar loss from the imports will go up or down, and thus there is no way the Government can strictly interpret the law.

The RFC has signed contracts for the importation of copper at 15.75c. a pound, f.a.s. South America. This brings the price, at American docks, to about 16.25c., almost 2c. over the domestic ceiling.

Bauxite From Pacific Islands May Come to West Coast

Henry Kaiser, who has entered the aluminum industry, among others, with the idea of building up West Coast big business, has not been frozen out by the recent deal concluded between the RFC and the Reynolds Metals Co. for the Hurricane Creek (Ark.) stockpile of bauxite. Apparently he does not want any domestic bauxite just now, from this stockpile at least. According to Government officials, he was influential in instigating the State Department's present exploration of certain Pacific Islands, including Tarawa and Guam, for high-grade bauxite. Should those islands prove to contain a good reserve, Kaiser's idea of a West Coast aluminum industry may readily be realized.

The aluminum plant at Baton Rouge, La., built by the Government during the war and recently sold to Kaiser, is being readied to resume production of alumina. Docks are being built, with the explanation by the Government that Kaiser intends, for the present, to import cheaper, higher-grade bauxite from Surinam and other South American sources. Should the Central Pacific sources prove worth while, it is likely that the Baton Rouge plant will be dismantled and taken to the West Coast. Kaiser also has his aluminum plant and rolling mill in the Columbia River Valley.

If the Pacific source is disappointing, Kaiser will use the Baton Rouge plant to treat South American bauxite, and ship the alumina to his West Coast plants. Either way, he will be in the aluminum business.

Cyanide Now Decontrolled

Cyanides of alkalies and heavy metals, and mixtures containing more than 25 percent of these chemicals, except silver cyanides, have been suspended from price control effective Aug. 22, OPA has announced. Included are sodium, potassium, copper, lead, and zinc cyanide.

NEWS OF THE INDUSTRY

Treasury Policy on Gold Exportation Defined

The Treasury Department has recorded firm opposition to the licensing of gold exportation. In a letter dated July 10, 1946, to Robert M. Searls, attorney for several California gold-mine operators, John W. Snyder, Secretary of the Treasury, stated that "under the present circumstances, the licensing of gold exportations without regard to the use for which such gold is exported would be inconsistent with the purposes of the Gold Reserve Act of 1934 and unauthorized by Section 3(c) of that Act."

The ruling was given in reply to a letter sent to the Secretary of the Treasury on June 6, jointly signed by Searls and by James M. Snell, attorney for the Mine Workers' Protective League, a labor organization with headquarters at Grass Valley, Calif. In this letter the writers cited the heavy increases in operating costs confronting operators of lode gold mines, uncompensated by a corresponding increase in the domestic price of the metal, and asserted that practically all of the 300 to 400 California gold mines which formerly gave employment to between 8,000 and 10,000 miners remain closed because of inability to meet just demands for wage increases. They went on to propose that the Secretary issue licenses to ship newly mined gold abroad, citing powers granted him under Article III and Section 34 of Article V of the Gold Reserve Act of 1934.

In his reply the Secretary pointed out that the proposed procedure for taking advantage of higher foreign gold markets would amount to circumvention of the import-export and foreign exchange laws of the countries involved. He added that transactions detrimental to the economy of foreign governments, even if technically permissible, would be contrary to the international financial and economic policy of the United States.

Striking Artisans Close Rhodesian Copper Mines

Already inadequate world copper supplies were further curtailed during July and August by a strike of European skilled workers at the Rhodesian copper mines. The men are members of the Northern Rhodesia Mineworkers' Union, but do not make up its entire membership. Beginning on July 15, the strike continued until Aug. 21 when the union agreed to accept arbitration. Pending determination of new wage scales by an official arbitrator, artisans were to receive an increase of 3s. a day.

Chief demand of the striking artisans was a wage increase of 10s. ($2.00) per shift. The companies made a counter offer of 3s. ($0.60) per shift. Wage of a married artisan after three years' service was $1.25 per hour before the strike; the 20 percent increase asked by the artisans is based upon increased living costs, which amount, they say, to much more than the 20 percent cost-of-living allowance granted during the war by the companies. Artisans' wages elsewhere in the United Kingdom, the union claims, have risen 51 percent since September, 1939.

Effect of the strike on world copper markets was marked by upward pressure on the copper price. Following as it did the tie-ups in American copper mines, the Rhodesian strike has combined with labor troubles in South American copper mines to increase anxiety of copper consumers everywhere regarding supplies.

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Hold Hearing on Potash Prospecting Permits

Announcement has been made by the Secretary of the Interior of a hearing to be held at the Hilton Hotel, Albuquerque, N. M., on Sept. 26 and 27 to review provisions of the Federal law pertaining to limitations on acreage holdings under permits issued for potassium prospecting. The hearing will be conducted by Oscar L. Chapman, Under Secretary of the Department of the Interior.

Those desiring to present information in person at the hearing must notify the Director, Bureau of Land Management, Washington, D. C., not later than Sept. 16. Written statements may also be filed with the Director on or prior to that date, or with the Under Secretary at the hearing.

The full text of this announcement appears in the Searchlight Section of this issue.

NEWS BRIEFS

Southwest Mining Get-Together. International Mining Days will be celebrated Nov. 1 and 2 at El Paso, Tex., with mining men in attendance from New Mexico, Arizona, Texas, Colorado, Mexico, and elsewhere. The gathering is sponsored by the Mining Committee of the El Paso Chamber of Commerce.

Airborne Magnetometer Surveys. Large-scale commercial application of the airborne magnetometer is planned by Aero Service Corporation, Philadelphia, Pa., starting in September.

CIO Mine Union's Executive Board Adopts Leftist Policies in Stating New Program

Left-wing philosophy of far-reaching effect on the country's economic system bulks largely in the "Statement of Policy and Program" recently adopted by the International Executive Board of the CIO Mine, Mill and Smelter Workers Union. Nationalization of the non-ferrous metals industry, organization of present non-union gold mines, intensified propaganda campaigns, nation-wide bargaining, further wage increases, and a third party on the political scene were among the union's announced aims.

Formulated by Reid Robinson, president, and amended before adoption by the Executive Board, the program will serve as a basis for discussion at the forthcoming convention of the MMSW. If adopted, the program will be regarded as basis for union activity during the coming year.

The statement opened with a reference to labor's present fight against "monopoly" and "reaction," whose weapons were said to be as deadly as a fascist bullet, and whose aim it is "finally, with deadly 'free enterprise' having killed all freedom, to divide the spoils." Among other vicious antics in the foreign field, the statement continues, reaction "brazenly sends the 'Great Benefactor,' Mr. Hoover, to

(*Continued on page* 130)

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British Mining Men Form Overseas Association

Addressing the inaugural meeting of the British Overseas Mining Association in London on July 29, Lord Geddes, president of the association's council and chairman of the board of directors of the Rio Tinto Co., Ltd., introduced the objectives of the new organization and discussed the status of British mining activities in various countries of the world.

Lord Geddes cited the basic importance of metals and minerals to the economy of an industrial nation and the failure of successive British governments to recognize the necessity of encouraging mine exploration and development. Expansion of the British overseas mining industry, he pointed out, had been a continuing process from the early nineteenth century until the years following World War I, when the steep increase in the standard rate of income tax drove mining entrepreneurs to countries outside the United Kingdom.

To bring to the attention of the Government the seriousness of this loss of activity, and to suggest remedies to the Chancellor of the Exchequer, a Mining Taxation Committee was formed in 1942. Through the efforts of this group important modifications of the taxation laws as applied to British mining companies were brought about in 1945. The results achieved by this unit effort impelled the leaders of the industry to create a permanent organization representative of all the overseas mining interests in the country.

One of the prime functions of the Association, Lord Geddes stated, will be to continue to review the question of taxation and to see that the benefits conferred on the United Kingdom by overseas mining are not lost for any technical, commercial, or political reason. The Association will also interest itself in tariff policies related to mining products and in the compilation of statistics of the industry. Its activities are not intended to overlap or compete with existing Chambers of Mines in the countries of the British Empire.

Reduction In Page Size Is Announced

Engineering and Mining Journal will adopt a standard 8¼ in. by 11¼ in. page size starting with this September issue. We regret that the paper shortage makes this change necessary in the course of the year. We should have preferred, for your convenience, if you bind the year's issues, that the change be made in January. However, your binder will, we are sure, be as willing and able to meet the situation as ours is. The issues September through December can be filled in at the stitching edge so as to equal the remainder of the year in width. The top and bottom margins of the first eight months are sufficiently wide to allow for trimming to the new length. We anticipate that this temporary inconvenience will be more than equalized by the advantage to the reader of a standardized size henceforth.

Canadian Government Acts To Relieve Gold Mines

The 10 percent reduction in the gold price sustained by Canadian gold producers as a result of official lifting of the Canadian dollar to parity with the American dollar on July 5 brought immediate and vigorous protests from the mine operators. Many low-grade mines which have come into production since the advance in the price of the metal in 1933 found their slender margin of profit in the $3.50 per oz. premium accruing to them from the 10 percent exchange differential, and were not prepared for the sudden move by Ottawa. All producing mines are faced with the necessity of recalculating ore reserves.

Representations to the Dominion Government have sought concessions for gold mining, principally in the form of lower taxes and higher allowance for depletion. Producers have also been pressing for permission to sell gold in the world market.

On July 26 the Government announced three measures designed to bring relief to marginal producers and to support exploration and development. New mines coming into production after Jan. 1, 1947, will be exempt from paying federal taxes for a period of three years. Producing mines are offered an optional method of figuring depletion allowance on a basis of $2 per oz. of gold produced in place of the present tax exemption amounting to 33 1/3 percent of profits before taxes. As a third palliative, the mint handling charge has been reduced from 35c. to 20c. an ounce.

Canadian mine operators generally have expressed dissatisfaction with the extent of relief afforded.

Michigan School of Mines Expands Facilities

The rapid transformation of historic Fort Brady into a residence center of the Michigan College of Mining and Technology began Aug. 10, on receipt of notice that the Federal Government had approved transfer of the property to Michigan's 60-year-old engineering college. The college will offer first-year work at this branch as well as at Houghton. It will also give short courses not comprising part of a bachelor's degree sequence.

At the college's invitation the University of Michigan is considering supplementing the college's staff so that a first-year curriculum in liberal arts as well as engineering and science will be available at the center. The college will furnish physical training, intramural sports, student health, and counseling.

The new branch is under the supervision of Extension Director F. L. Partlo. The resident director will be Prof. H. W. Risteen, who recently returned to the mechanical engineering faculty after a distinguished record of service in the Seabees.

Although the War Assets Administration subsequently suspended the proposed sale or lease of surplus camps for educational purposes, Grover C. Dillman, president of the college, believes that the transfer will be found in conformity with existing laws and ultimately authorized.

U. S. Gold Production Trends Upward

Rising production in South Dakota, California, Colorado and Idaho contributed chiefly to a 9 percent gain in total U. S. mine production of gold in May, according to the U. S. Bureau of Mines figures shown in the accompanying tabulation. A steadily expanding rate of operation at the Homestake mine is reflected in the South Dakota total.

U. S. Mine Production Of Gold In Fine Ounces

Region and State	1945 (Monthly Average)	1946 Jan.-Mar. (Monthly Average)	1946 April[1]	1946 May
Eastern States	162	120	120	120
Western States:				
Arizona	6,233	5,804	5,500	5,300
California	11,756	24,033	27,500	29,000
Colorado	8,226	10,274	10,385	12,045
Idaho	1,586	1,217	1,900	3,500
Montana	3,570	3,450	3,600	3,900
Nevada	7,865	7,133	8,500	6,500
New Mexico	417	338	413	415
Oregon	357	970	1,120	900
South Dakota	4,662	22,733	24,187	30,160
Utah	22,693	6,317	2,500	2,200
Washington	4,879	5,233	5,150	4,450
	72,244	87,502	90,755	98,670
Alaska	5,107	2,749	214	1,000
Total United States	77,513	90,371	91,089	99,490

[1]Revised figures

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OPERATING IDEAS

Portable Switch For Heading Operations

This effective substitute for a cherry picker for heading operations is submitted from Northwest Territories, Canada. At convenient intervals, a side-swipe round is taken out of the side of the drift. A hinged switch point is installed near the right rail of the track as shown in the illustrations. The second point which deflects the car wheels from the left rail over the right rail of the track is also retractible. Thus main rails remain unbroken for this installation, and the need for switch frogs is eliminated.

Cordless Switch Prevents Shaft Accidents

In many shaft signal systems, one switch is provided on each level to call the cage, and a second one, generally of the pull-bell type, to direct cage motion. The latter is installed on shaft timbers.

There is always a danger that a new workman may inadvertently pull the signal governing cage movement on one level, while the cage is being loaded or emptied on another. To eliminate this hazard, several Canadian mines have removed the rope from the switch directing cage motion, and substituted a long narrow hook which fits into the bell hook, and is handled by the cager only. The call signal however, is equipped with a cord. Thus a man can call a cage, but cannot direct its movement.

One of the two wheels above was in use for four months on a charging machine where it was daily subjected to repeated loadings of 300,000 pounds. Previously, regular carbon steel wheels would mushroom and have to be taken out of service in two weeks, thus presenting an expensive maintenance problem involving three men to make the replacement. A heat treated wheel of Jalloy steel was substituted and after four months' service removed for inspection. It is the wheel on the right. No appreciable wear can be seen when compared to the wheel beside it that was never in service. If you have an application that requires resistance to abrasion, fatigue and high impact strength write to us about heat treated Jalloy.

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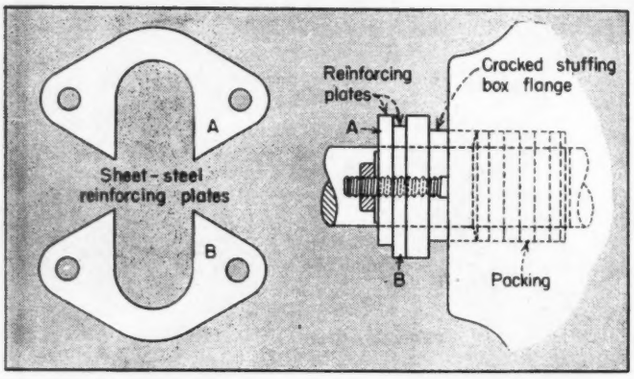
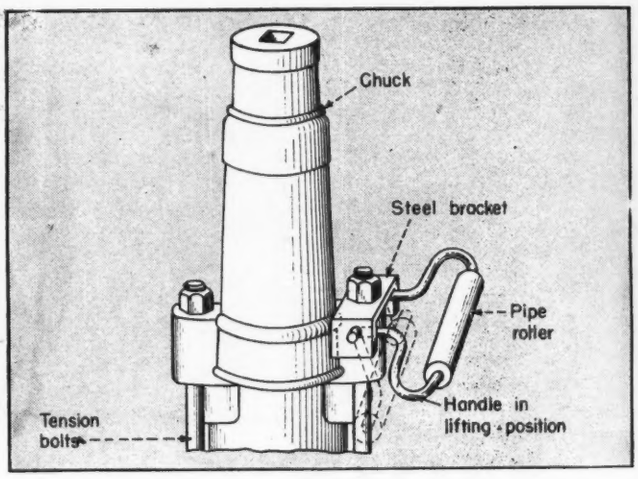
Emergency Repair for Pump Stuffing Box



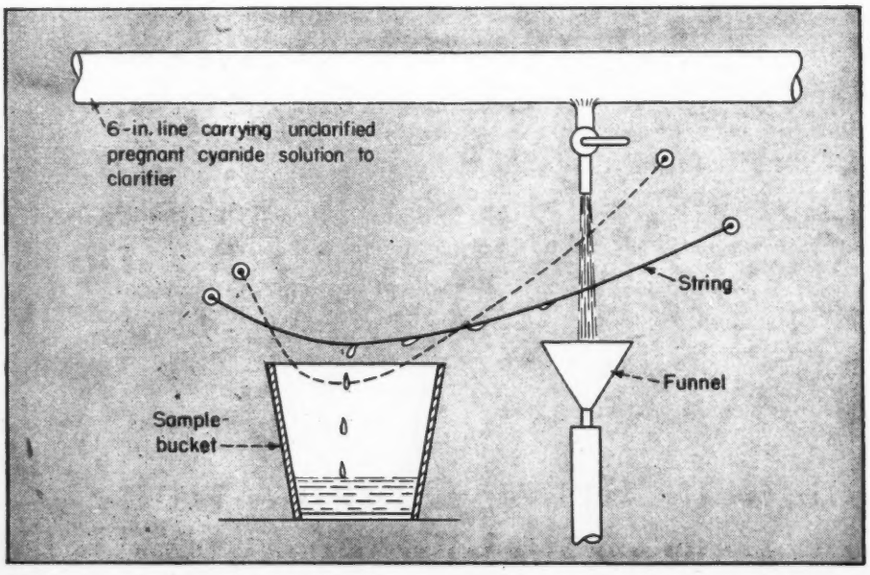
Recently at a gold-silver mine in central Mexico a maintenance man, while taking up the pump packing to stop leakage, accidentally cracked the stuffing-box flange on a large centrifugal pump operating underground. No spare part was available, and shutting down the pump until a new flange unit could be made at the mine machine shop was out of the question. The only solution to the problem appeared to be adequate reinforcement of the cracked flange until a permanent repair could be made. This was successfully accomplished in the manner shown. Two plates of sheet steel were cut and placed in front of the cracked flange. This permitted the packing to be tightened sufficiently to stop leakage until a new flange could be made.

Handy Holder for Stoper Drills

With the cylinder, piston, chuck, and other auxiliary parts outweighing materially the telescopic air feed, the stoper drill, in the parlance of the driller, is "front-heavy." Because of this "unbalance," its handling in narrow workings and during transportation and lifting is somewhat awkward and injuries to fingers and hands often result. To reduce this danger, and at the same time facilitate the handling of the drill and speed up collaring of holes, Phil Keast, master mechanic, Empire Star Mines Co., Ltd., Grass Valley, Calif., designed the simple handle shown in the accompanying illustration. It consists of a U-shaped steel bracket and the handle made from a short length of round steel and pipe. It is held to the top of the chuck flange by the tension-bolt nut. When not in use, the holder drops into rest position as shown. Both the bracket and handle were made from scrap materials.



Suspended String Cuts Solution Sample



The tendency of mechanical samplers to lime up when used on pregnant cyanide solutions sometimes causes difficulties for mill operators. This problem is handled at the Kerr-Addison mill, Virginiatown, Ont., by mounting a string across a small stream of unclarified pregnant cyanide solution, which is diverted from the 6-in. pipe line to the clarifier as shown. Drops of solution run down the string at a uniform rate.

The size of the sample cut can be varied by raising or lowering the string as shown. The steeper the slope of the sagging string, the greater will be the amount of solution diverted during any given period. George Hawkes, metallurgist, contributes this sketch.

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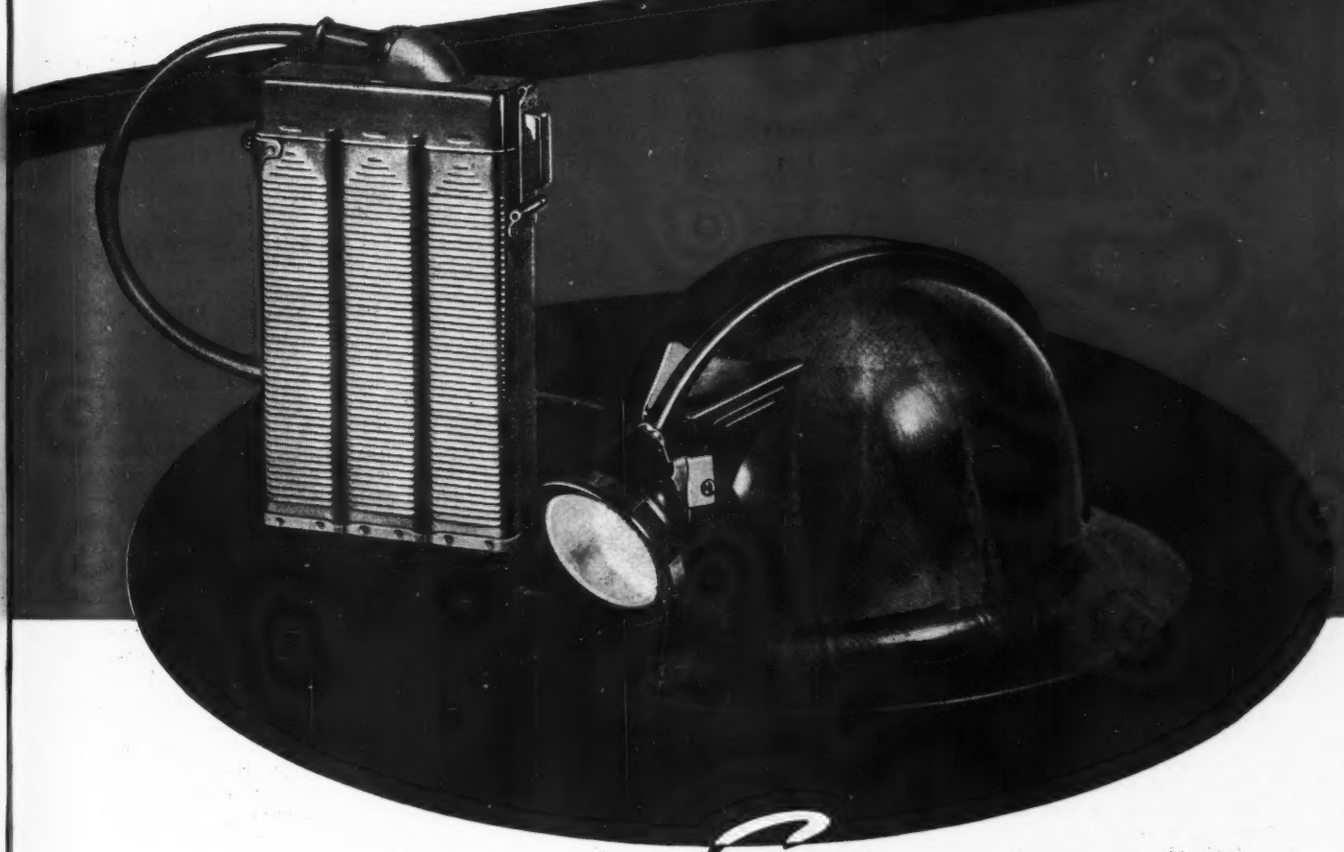

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NEW BOOKS

LE COBALT. By Robert Perrault. Published by Dunod, Paris, France, 1946. Pp. 150. Price, 390 francs.

Here we have a 150-page monograph on cobalt. Being in French, it is a closed book to many American engineers and metallurgists, although most of the data of the monograph are available in American or English publications. The detailed description of the French Moroccan deposit is, however, particularly valuable to many of us.

The book follows the usual order—the metal's history, its ores, its principal ore deposits, ore treatment, the metal's properties, its uses, and production and consumption. The monograph ends with a rather complete bibliography, which, however, is arranged neither chronologically nor alphabetically, and an index and table of contents better than those expected in a French technical book.

Like that of so many metals, the center of production has shifted from country to country, the sequence in cobalt production being Saxony, New Caledonia, Canada, and at present the Belgian Congo and Rhodesia.

As one mulls over the present usage of the metal, one realizes that in the past two decades the demand for its salts has remained static, but that its use as an alloy in permanent magnets and high speed steels has notably expanded. As a catalyst, its powder is important.

Unfortunately, due to the times, the author does not mention the more recent American developments other than those at Bethlehem, Pa. Of considerable interest is the small production of the Sullivan Mining Co.'s electrolytic zinc plant, the production of Fredericktown, Mo., and that of a talc mine at Burlington, Vt., and the contemplated operations of the Howe Sound Co.'s properties in Idaho.

S. H. BALL

MINING YEAR BOOK, 1946. Compiled by Walter E. Skinner, 20 Copthall Ave., London, E. C. 2, England. Pp. 472. Price 31s. 6d. net. Post free abroad.

This is the 60th annual issue of this standard reference work. It contains up-to-date particulars respecting 825 mining companies operating in all parts of the world, together with the names and addresses of 900 mining engineers and mine executives and the companies with which they are connected. The information presented includes the names of directors and other officials of each company listed, the description of its property and plant, the operating results as well as the capital, dividends, and financial results. These data are up to date, taking into account whatever changes have taken place during the past year. Other features include maps and plans of various properties, tables of gold production, and a supplementary index giving the names of companies that have been described in previous volumes. The accompanying Buyers' Guide to Manufacturers of equipment lists 494 companies.

PERSONALITY AND ENGLISH IN TECHNICAL PERSONNEL. By Philip B. McDonald, professor of English, College of Engineering, New York University. D. Van Nostrand Co., Inc., New York. Pp. 424; 6x9 in. Price, $3.75.

Long experience, erudition based on years of study and observation, and a wealth of data culled from pertinent sources combine to make Mr. McDonald's contribution to engineering technical literature noteworthy, timely and serviceable. His work is designed to afford students of engineering an opportunity to supplement regular science courses of the popular or "practical" sort with those cultural elements the lack of which is responsible for much of the postgraduate floundering that follows soon after graduation and the acquisition of a job. The 31 chapters in which the work is divided are packed with sage advice and wise counsel. They provide opportunities for self-analysis and self-correction of most of the embarrassing deficiencies which handicap so many of the victims of the current chaos into which theorists and muddlers have forced our systemless academic processes. To write an interesting and a sound work on writing and related functions is a distinctive accomplishment.

Mr. McDonald has combined a mastery of his subject with the arts and methods of the practiced and successful academician. The result is a volume which few engineers of whatever sort can afford to do without. Obviously (if one will give the matter a moment's thought) technical accuracy is as essential in speech and writing as it is in every department of mathematics. The wonder is, that so few recognize this fact.

Most of the pages of "Personality and English" are devoted to those subjects and techniques covered by similar texts, many of which are out of print. The need, however, for iteration and reiteration respecting these matters is realized by executives everywhere and by all having to do with the production of the printed word.

Chapters 24 to 33 supply classical material a knowledge of which is indispensable to the intellectual equipment of every fairly well educated man and woman. Ignorance of the contributions of antiquity to the sum total of human knowledge is a marked handicap to all except hermits and professional misanthropes.

To quote Mr. McDonald: "It is better to learn one's faults from a book than to learn them the hard way." And: "Wisdom can be more important than knowledge." W.N.P.R.

MINING DIRECTORY OF MINNESOTA, 1946. By Henry Wade, State Mines Experiment Station, University of Minnesota, Minneapolis. Pp 236, 4¾x6¾ in. Price, $1.

This annually-issued volume is one which every mining man in the Minnesota Iron Country keeps close at hand for its value as a reference. Aside from detailed information as to the often more-or-less complicated ownership of the mining properties, there are few questions that can be asked respecting Minnesota iron mining that cannot be answered with its assistance.

The 1946 book is like the many that have preceded it, consisting of 4 parts. Part I contains maps compiled by the Mines Experiment Station, showing the location of the mines and reserve properties, listed in Part II. The second section gives pertinent information on all properties that have shipped ore, or are listed on tax records as containing merchantable ore. Part III consists of a list of all of the operating companies and the major holding organizations identified with the Minnesota ranges, together with a list of the officials, subsidiary and affiliated companies, and the properties in which they are interested. Part IV is statistical, presenting figures on reserve tonnages, shipments, or analyses, beneficiation, ore docks, Lake boats, ore prices, freight rates, taxes, imports, exports, and foreign production.

ROCK TUNNELING WITH STEEL SUPPORTS. By R. V. Proctor and T. L. White. Published by the Commercial Shearing & Stamping Co., Youngstown, Ohio. Pp. 271. Price $2.50.

The 12 chapters of this book are divided into four sections. The first section, which has been prepared by Karl Terzaghi, consulting engineer, covers rock defects and loads on tunnel supports. Mr. Terzaghi, after discussing the principal types of rocks, considers their defects, classifying

these into mechanical and chemical. He devotes the succeeding chapters to consideration of load on tunnel supports and the influence of rock condition on the rock load. The greater part of the chapter is devoted to a consideration of tunneling through rocks occurring under different conditions, such as intact rock, unweathered stratified rocks, schists, moderately jointed massive rock, blocky and seamy rock, squeezing rock, and decomposed rock and clay. Mr. Terzaghi's concluding chapter is the forecast of pressure and working conditions in rock tunnels.

Section II discusses the selection and design of the tunnel support, considering first the factors affecting the layout of the support and then the constituent members of the supports. The concluding chapter of this section is devoted to problems of tunnel or mining through soft or squeezing ground.

Section III covers the dimensioning of tunnel supports, considering first the basic concepts and related data and next the forces and stresses underground in blocked ribs. The method of computing force and stress is developed. Detailed procedure of computing stresses, with examples, is described in a concluding chapter.

The fourth and final section is a catalog of steel supports for rock tunneling. The commercial aspect of this publication is limited to this section in that the supports described are those made by the company publishing the volume.

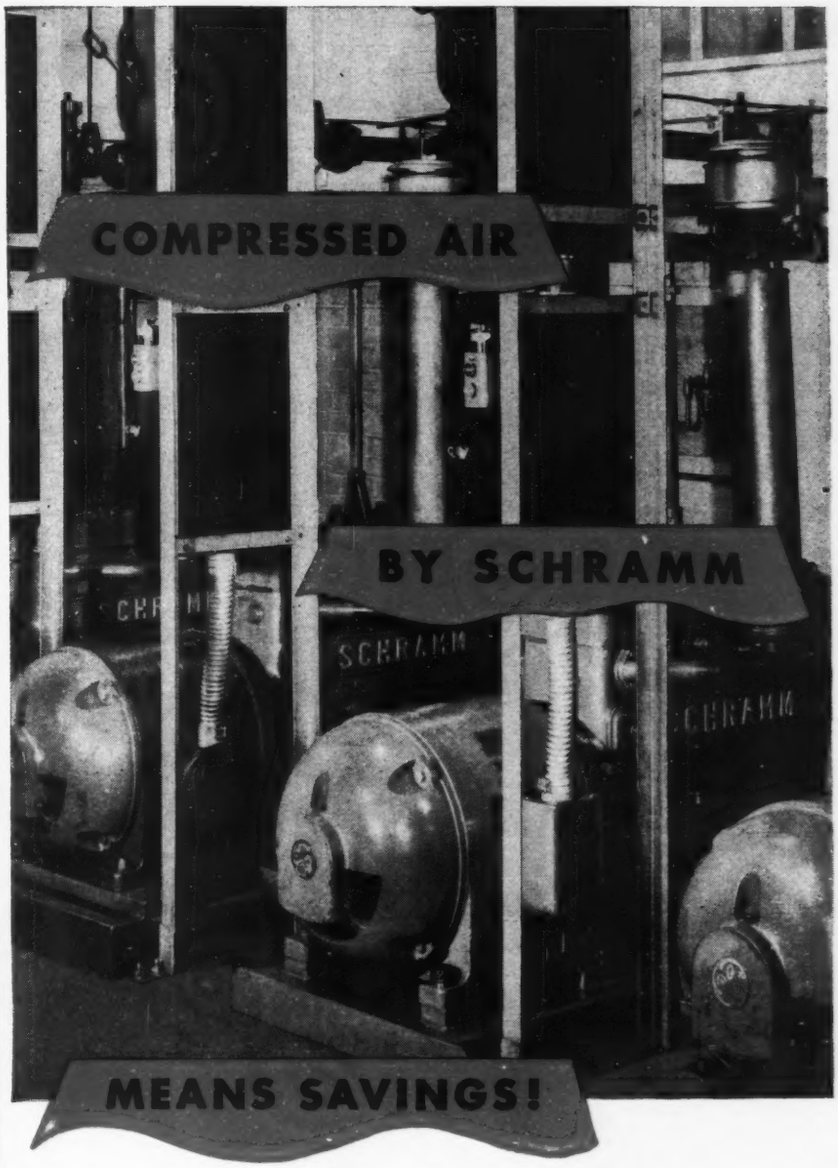
The new book in its entirety consists of an immense amount of information that will be useful to any contractor or group undertaking to drive a tunnel.

PUBLICATIONS RECEIVED

"American Standards Year Book 1945–1946." Published by American Standards Association, 70 E. 45th St., New York 17, N. Y. This year book contains the complete list of approved American standards and projects under development, classified according to the respective field. The first to be published in some time, it contains much new material. Twenty-eight standards are listed under "Mining," this including coal, metal, and nonmetal mining. In addition, a great amount of information about the association, its committees and bylaws is given. Pp. 112 plus index.

Tanganyika. "Explanation of the Geology of Degree Sheet No. 17 (Kahama)." Bulletin 15, Geological Division, Department of Lands and Mines, Dodoma, Tanganyika Territory. Pp. 39, plus Degree Sheet 17.

"The Transactions of the Canadian Institute of Mining and Metallurgy and the Mining Society of Nova Scotia, 1945." Vol. XLVIII. Published by the Secretary's office, 906 Drummond Building, Montreal, Quebec. Pp. 794.



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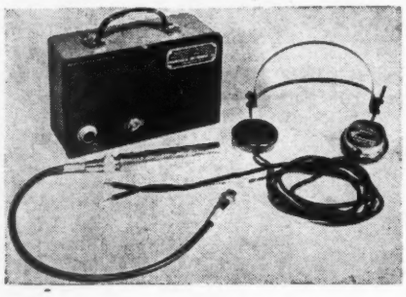
EQUIPMENT NEWS

Radioactivity Detector

Light in weight and self-contained, the new model 5A radioactivity detector recently announced by Geophysical Instrument Co., Key Blvd. and Nash St., Arlington, Va., is said to answer the need for a portable means of making gamma ray intensity measurements. Among possible uses for the new instrument are: locating and

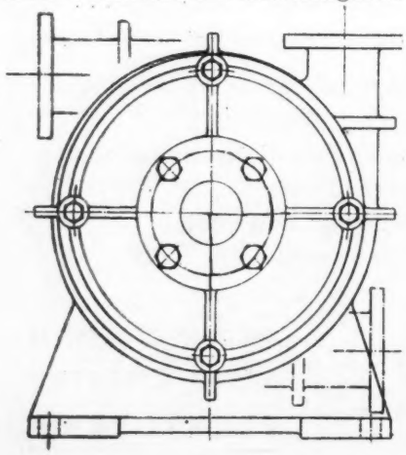


testing of radioactive ores; finding lost radium; quantitative determination of concentration of radioactive material.

The device makes use of a Geiger-Müller tube connected to the instrument proper with a short cable. Weighing 4¾ lb. and with outside dimensions of 7x5x3 in., the instrument contains all necessary amplifying apparatus and batteries. Standard flashlight and radio miniature B batteries are used. Price of the complete equipment as pictured is $150.00, f.o.b., Arlington, Va.

Sand Pump Improved

Certain improvements have been announced recently by Allen-Sherman-Hoff Co., Philadelphia, Pa., in their Hydroseal pump for handling abrasive materials. Listed among the new features are: new heavy-duty anti-friction radial and thrust bearings, which are now standard and interchangeable

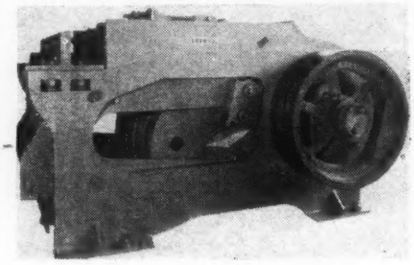


on Hydroseal pumps; improved means for easy, two-way axial adjustment of the shaft and bearing assembly; support of pump shell and engine side bell by the bearing housing, which permits pump discharge to be placed in any of the three positions indicated in the drawing.

The high efficiency and low maintenance cost of past models, the manufacturer states, are retained in the new model through unchanged application of the Hydroseal principle and use of Maximix rubber pumping parts. Full details will be furnished by the manufacturer.

Two-Stage Crusher

Latest design of the Ebersol two-stage crusher, a product of Ebersol Crusher & Engineering Co., Lancaster, Pa., is shown in the accompanying photograph. Material crushed in the upper jaws passes over the screen visible in the picture before entering



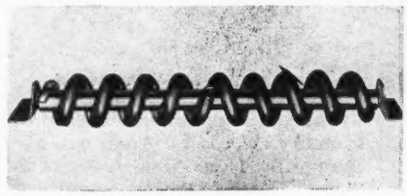
the lower jaws. Screen undersize bypasses the lower jaws, thus relieving them of some of the load and permitting a closer setting. In this crusher, both jaws in each case are movable, a design that decreases jaw plate wear. The size shown, 9x40-in., driven by a 75-hp. motor, has crushed 40 tons of rock per hour to ¾-in.

Steam Turbine Study

Steam turbine plant operators in the mining field are invited by Allis-Chalmers Mfg. Co., Milwaukee, Wis., to participate in a cooperative study to increase power plant efficiency through analysis of the nature and cause of turbine blade deposits. The company is offering to analyze, without charge or obligation, steam turbine blade deposits from any make of turbine operating at throttle pressures of 350 lb. or higher, provided the samples are taken in accordance with certain recommended procedures. A summary of the results of the survey will be prepared and distributed to those cooperating. The sources of all information will be held confidential. For additional information, write Dr. L. A. Burkardt, Research Laboratory, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Spiral Return Idler

In belt conveyor installations where ice formation or high abrasive wear on idler rolls causes trouble, Chain Belt Co., Milwaukee, Wis., suggests the use of its new Rex rubber-covered spiral return idler. Ice formation on



return idlers is greatly retarded by the spiral design, which loosens any deposits because of the varying point of contact between belt and idler. Abrasive action is reduced by the rubber-to-rubber contact between belt and idler. The right and left hand construction tends to center the belt.

Plastic Insulators

Insulating caps, sleeves, and tubing for electrical connectors, cable ends, busbars, tools, and other equipment are now available in a new form from General Electric Co., Pittsfield, Mass. Made of plastic in special colors for identification purposes, the desired form is soaked in a dilator solution that causes it to expand to half again its normal size. The insulator can then be slipped over the part in question and allowed to dry, whereupon it will shrink to smaller than original size, thus forming a tight covering over the exposed surface. The various forms can be stored indefinitely either in or out of the dilator solution.

Slurry Pump

In announcing the new Type R Morris slurry pump, Morris Machine Works, Baldwinsville, N. Y., points out that the pump is designed to take its suction from the drive side, which results in the gland packing being subjected only to suction or positive-head feed pressures. Therefore, the pump operates equally well under high suction lift or positive head, and it may be connected, the manufacturer states, directly to any tank, or be cut into the line as a booster pump, without an intermediate pressure tank or a suction hopper. The pump was designed

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For extra capacity*... lower costs!

Today, in many mines, the spotlight is on cost-saving developments in mine haulage. In batteries, for example, the talk of the industry is the new Philco "Thirty", with 30% longer life! Already, Philco "Thirty" has proved its extra capacity for hard work, and its lower cost per ton hauled. Yes . . . Philco "Thirty" has the modern 10% extra capacity* construction. Write for specification data. PHILCO CORPORATION, Storage Battery Division, Trenton 7, N. J.

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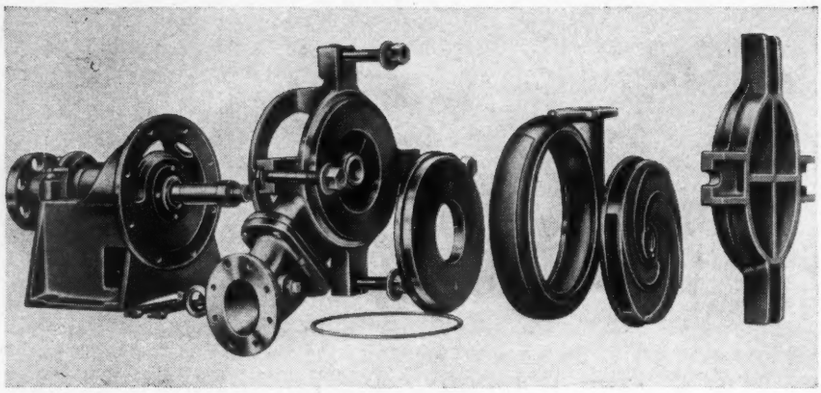
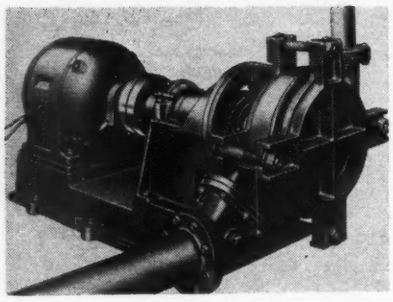




to avoid most of the stuffing box maintenance troubles that have faced mine and mill operators in the past.

Available in a choice of 11 different materials, ranging from gray iron to Morris Flint Metal, the pump can handle all types of sludges and slurries, including caustic or acid mixtures containing abrasives. Full details will be supplied on request.

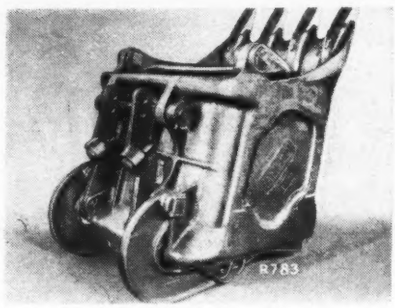
Pre-heated Air Supply

Gases can be heated above the operating temperatures permissible in metallic heat interchangers by means of a new heat transfer unit developed by Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y. Called the "pebble heater," the unit consists of two chambers, one above the other, both filled with refractory pebbles. An opening in the lower chamber is adjusted to cause a steady flow of pebbles down through both chambers, whence they are elevated and returned to the upper chamber. Fuel and air are burned in the upper chamber; the gas to be heated flows through the lower chamber.

Because of the high temperatures possible in heating the refractory pebbles, temperatures higher than ordinary can be reached in the gases to be heated. For example, air can be heated to 2,300 deg. F. and steam, to 1,800 deg. F. One of the first uses of the device has been in pre-heating air used for the combustion of fuels in furnace work, and temperatures have been reached that were generally considered to be in the field of electric furnaces. The unit is said to be low in both initial and operating costs and to be highly efficient.

Manganese Steel Dippers

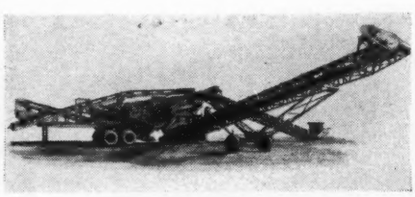
To meet a demand for a dipper with optimum durability and over-all weight, American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill., has introduced the Amsco all-manganese steel welded-type dipper. Pictured herewith, is a 2-cu. yd. dipper consisting of four body pieces of manganese steel welded into a unit with the strength of a one-piece dipper, yet possessing the advantage of possible replacement of a worn



front piece without destroying the back. Sizes range from ¾-cu. yd. up.

Diesel-Electric Rock Plant

First in a new line of portable semi-electric powered duplex crushing and screening plants is the No. 46VE announced recently by Pioneer Engineering Works, Minneapolis 13, Minn. Screen and conveyors are driven by



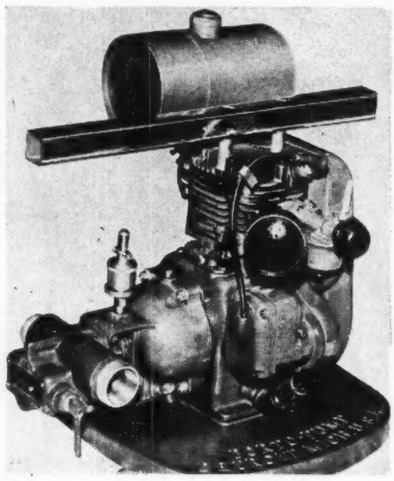
electric motors powered by a diesel electric plant. Roll crusher is driven by V-belts from the jaw crusher, which in turn is driven by flat belt from the diesel engine. The electric motor drive has permitted much simplification in design. Details on size and capacity will be furnished by the manufacturer.

Motor-Generators

A wide variety of gasoline or electric-powered motor-generator sets are offered by Motor Generator Corporation, Box DM704, Troy, Ohio, a division of Hobart Bros. Co. The equipment is suitable for lighting plants, battery charging, welding, electroplating, and similar purposes.

High-Pressure Pump

Designed primarily for use in fighting forest fires, the Porto-Pump, a high pressure unit manufactured by Porto-Pump, Inc., Detroit, Mich., has also been adapted to small-scale placer mining, jetting by bridge and dock contractors, stake jetting by fishermen, and in oil well survey work. The pump is set for a maximum pressure



of 165 psi., and it delivers over 43 gpm. at 100 psi., and over 40 gpm. at 120 psi. Suction lift is 31 ft. Power unit is a single-cylinder, 5-hp. engine. A by-pass valve is used so that nozzles may be changed or hoses added while the pump is operating.

INDUSTRIAL NOTES

Thomas C. Baker, until recently a Lieutenant in the Navy, has become a sales engineer for **American Manganese Steel Co.** in Oakland, Calif.

Booth-Irani Engineers, Inc., Lionel E. Booth, president, Salt Lake City, Utah, has been organized to do engineering and metallurgical work in India. Complete milling equipment will be offered by this company in India, and metallurgical services will be available at offices in Bombay.

M. R. Walton and Associates, Silver City, New Mexico, are now in position to accept commissions and assignments in the petroleum, the iron and steel, and the general mining industries. Mr. Walton was for 19 years associated with Arthur G. McKee and Company, Cleveland, Ohio.

Forest S. Burtch has been promoted to manager of sales of the wire rope

division of **John A. Roebling's Sons Co., Trenton, N. J.**

American Cyanamid Co., New York, N. Y., announces that, effective July 31, 1946, the business of **American Cyanamid & Chemical Co.** will be combined with that of the parent company, to be operated hereafter as the **Industrial Chemicals Division** of American Cyanamid Co.

Vernon H. Van Diver has left **Union Carbide & Carbon Corporation** and has opened his own business as merchandising and advertising counselor in the McGraw-Hill building, 330 West 42nd St., New York 18, N.Y. He will also head the **Brad-Vern** advertising agency.

BULLETINS

Mine Locomotives. Trolley, battery, and combination mine locomotives, as manufactured by Goodman Mfg. Co., Chicago 9, Ill., are described in Bulletin CH 454 recently issued by that company.

Brattice Cloth. Actual samples of their A.B.C. jute brattice cloth are contained in Bulletin 646, now available from American Brattice Cloth Corporation, Warsaw, Ind. Three grades are presented and the company's exclusive flame-proofing process is explained. A separate bulletin, No. 846, presents samples of the company's Mine Vent flexible ventilation pipe.

Mine Hoists. A wide variety of self-contained electric mine hoists is described in detail in Bulletin A-407, recently published by Vulcan Iron Works, Wilkes-Barre, Pa.

Electrode Chart. A wall chart and color guide to the selection of arc welding electrodes is now available from Air Reduction Co., 60 East 42nd St., New York, N. Y., or any branch office.

Log Washer. An improved log washer is described in detail in Bulletin 7B6411, which can be obtained by writing Allis-Chalmers 644, Milwaukee 1, Wis.

Safety. The various items of protective clothing and equipment furnished by E. D. Bullard Co., 275 Eighth St., San Francisco 3, Calif., are described in a recent bulletin of that company.

Brake Lining. United States Asbestos Division of Raybestos-Manhattan Inc., Manheim, Pa., has prepared a new 44-page catalog describing Grey-Rock balanced brake lining and its uses.

Heat Insulation. Foamglas insulation in brick, or other form, for use in roofs, furnace sidings, tank linings, and similar uses is described in several new bulletins of Pittsburgh-Corning Corporation, Pittsburgh, Pa.

Aerial Cable. Self-supporting cables for both power transmission and communications use are described in a new bulletin of Simplex Wire & Cable Co., 79 Sydney St., Cambridge 39, Mass.

Explosives. A new booklet listing and describing Hercules chemicals and industrial explosives is available from Hercules Powder Co., Wilmington, Del.

Blast Hole Drills. Keystone Model 51 crawler-mounted blast hole drills are described in a new bulletin, No. BD-1141, recently prepared by Keystone Driller Co., Beaver Falls, Pa.

Mine Drainage. Transite pipe and its specific application in mine drainage problems are discussed in a new bulletin of Johns-Manville Co., 22 East 40th St., New York, N. Y.

Thickeners. Thickening, clarifying, and agitating equipment manufactured by the Hardinge Co., York, Pa., is described in bulletin 31-D, available from the company. Typical data and complete descriptions are given.

Wire Stringing. Clear and simple instructions for wire stretching and stringing are provided in a new bulletin issued recently by W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44, Ill.

Centrifugal Pumps. Ingersoll-Rand Co., Phillipsburg, N. J., announces publication of a new 16 page catalog on its two-stage centrifugal pumps, many of which have found application as station pumps in mines, as well as in other industries.

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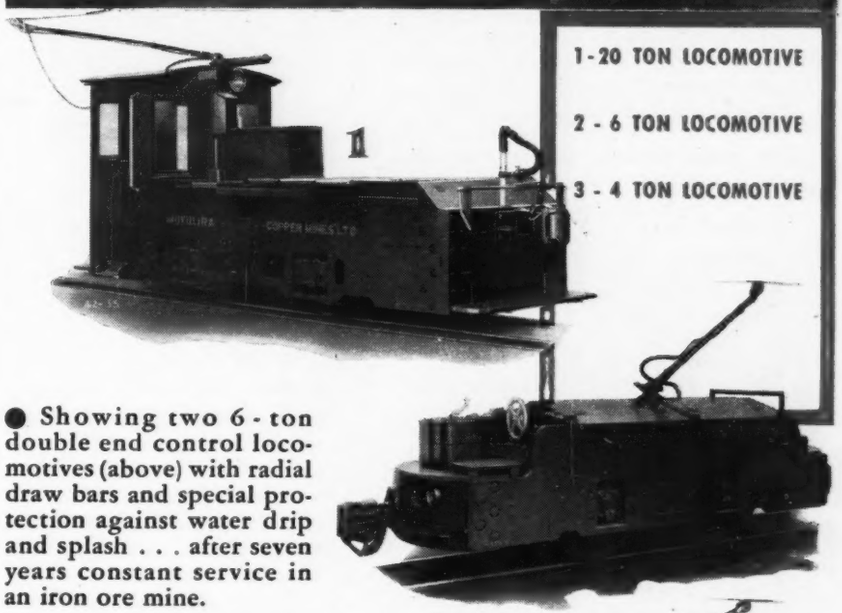
LOCOMOTIVES

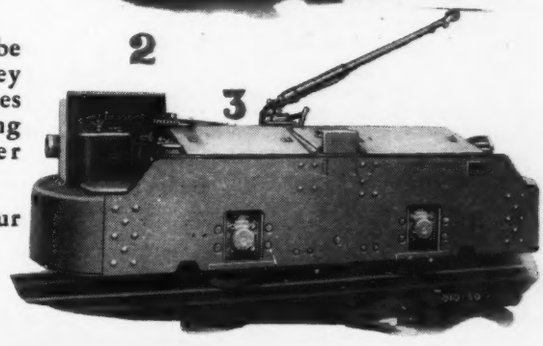
for metal mine transportation



● Showing two 6 - ton double end control locomotives (above) with radial draw bars and special protection against water drip and splash . . . after seven years constant service in an iron ore mine.

Jeffrey locomotives can be furnished in both trolley and storage battery types to meet specific operating conditions. A few other types are shown.

Consult Jeffrey on your haulage requirements.



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PERSONAL NEWS

O. A. Sundness has been appointed manager of the Snyder Mining Co. properties in Minnesota, succeeding E. J. Maney, deceased.

Arthur H. King has succeeded **John G. Bennetts**, of Calumet, Mich., as assistant secretary of Calumet & Hecla Consolidated Copper Co., Mr. Bennetts having retired.

E. E. Hunner, until recently M. A. Hanna general manager, has been designated senior representative of the company in the Lake Superior region and executive consultant. **Russell C. Fish**, who had been his assistant, succeeds Mr. Hunner as general manager of all company iron-ore mining operations in the Lake Superior area and New York State and Missouri. **G. M. Cannon**, former Michigan manager of mines, becomes management consultant. **Richard W. Whitney** has been made general manager of all mining operations in Minnesota, and **S. E. Quayle**, manager of Michigan iron ore mines.

William R. Welton, superintendent of the Virginia district mines of the Oliver Iron Mining Co., retired on Aug. 1 after 41 years of service with the company on the Mesabi Range.

Promotion of five mining men in the Virginia-Eveleth district of the Oliver company, effective Aug. 1, has been announced. **I. O. N. Swanson**, for the last three years superintendent of Eveleth mines, has been named assistant general superintendent of the district. **Joseph M. Johnson**, assistant superintendent of the Spruce mine, has been named superintendent of the Spruce and Nelson mines. **K. H. McInnis** has been appointed assistant superintendent of the Fayal No. 2 open pit and the No. 3 underground. **L. S. Campbell** has been made superintendent of the Rouchleau and Prindle mines. **J. H. Harrison** has been promoted from assistant superintendent to superintendent of the Mountain Iron mine.

Frank Hamilton has been elected vice president of Nicaro Nickel Co., subsidiary of Freeport Sulphur Co., **Langbourne M. Williams, Jr.**, president, announced recently. Mr. Hamilton, who has been assistant to the president, joined Freeport Sulphur in 1943.

William F. Kett, who has been in the service of the Mountain Copper Co., Ltd., for 41 years, is scheduled to retire as general manager on Oct. 1. He will be succeeded by his son, **Laurence T. Kett**. The executive office of the company is at 216 Pine St., San Francisco, Calif.

Col. James Boyd is the new dean of Colorado School of Mines at Golden, Colo. Formerly he directed industrial operations in the American zone of German occupation as an aide to Lt. Gen. Lucius D. Clay, and more recently represented the United States

COL. JAMES BOYD

in four-power negotiations concerning the status of German industry. Col. Boyd is a graduate of California Institute of Technology, and received a doctor of science degree from Colorado School of Mines in 1934. Prior to his appointment as chief of metals under the Secretary of War in 1940, he was associate professor of geology at Golden. He is married and has four sons. He succeeds **Jesse R. Morgan**, who retires after 20 years as dean.

Dr. R. A. Smith retired as State Geologist of Michigan on Aug. 1 after 27 years of service. **Gerald E. Eddy**, who has been with the State Geological Survey since 1933, was appointed to succeed him.

Paul M. Tyler, for many years with the U. S. Bureau of Mines, returned from Europe last spring. After completing reports covering investigations on metals and minerals in Germany, for the Department of Commerce, he resigned from Government service. At present, he is executive officer, Massachusetts Institute of Technology Metallurgical Laboratories, Watertown, Mass.

E. J. Sireyjol, for several years general manager of La Compañia Francesca de la Mocupia, recently left Venezuela for Canada en route to France. **John C. Davey**, consulting mining engineer to the Venezuelan Government, is proceeding to Cornwall, England, on vacation after nearly four years of varied field work and the preparation of economic reports on mineral deposits and various industrial projects.

Dr. Carlos Paradisi has been appointed Director of Mines for Venezuela in succession to **Senor J. Car-Denas Varela**, who has been transferred to the Banco Obrero. Dr. Paradisi obtained his technical training in Chile and on his return to Venezuela was for some time attached to the Servicio Tecnico de Mineria y Geologia of the Ministerio de Fomento. **Dr. A. Yates**, chief geologist of the International Nickel Co. in Venezuela, returned to New York last July on completion of the examination and sampling of the nickeliferous deposits in the states of Aragua, Miranda, and Cojedes.

Carl Zapffe, geologist, manager of iron ore properties for the Northern Pacific Railway Co., has been appointed Brainerd Minnesota Community chairman of the Committee for Economic Development.

John Edwin, mining engineer, of Las Vegas, N. M., has moved his residence to Donna, Tex. At present he is in the Guianas on exploratory work for American interests.

Dudley Keen, recently with Pickands, Mather & Co. at Ironton, Minn., has resigned to engage in consulting mining practice on the Cuyuna iron range.

Shiou Chuan Sun, recently on the faculty of M.I.T., has accepted an appointment as assistant professor in mineral engineering at Pennsylvania State College, State College, Pa.

Robert M. Dreyer is associate professor of geology at the University of Kansas.

W. B. Montgomery, mine superintendent for Kenville Gold Mines, Ltd., subsidiary of Quebec Gold Mining Corporation and Noranda Mines, has been promoted to manager.

Ward T. Graham, mining engineer, has been appointed mine manager of Scranton Consolidated Mining Co., operating in the Ainsworth mining division of British Columbia.

J. P. Bickell, president of McIntyre Porcupine Mines, has become chairman of the board. **Balmer Neilly**, executive vice president, succeeds Mr. Bickell as president.

Frank E. Briber, mining engineer, has resigned as secretary and director of the Denver Equipment Co. and its affiliated companies, and may be reached at 5045 E. 17th Ave., Denver 7, Colo.

M. R. Walton and Associates have established offices in Silver City, N. M., as general engineering consultants

in national and international investigation, specializing in Latin-American commissions and assignments.

Cecil L. Elliott, of San Fernando, Calif., former mill superintendent with Benguet Consolidated Mining Co. at Masinloc, Zambales, imprisoned by the Japanese from January, 1942, to February of last year, has returned to the Philippines to resume his position.

Milton F. Williams has been named associate chemical engineer; **Robert L. Bennett**, associate concentrating engineer; **Stephen F. Willey**, assistant concentrating engineer, and **Oliver B. Cole**, laboratory assistant at the Oliver Iron Mining Co.'s new research laboratory in West Duluth, Minn.

J. G. Huseby, for the past eleven years general superintendent of operations for the Mountain Copper Co., Ltd., in Shasta County, Calif., has recently been appointed assistant manager, with headquarters at 216 Pine St., San Francisco.

W. C. McClung, formerly superintendent of the Hornet mine, has taken over the duties of general superintendent of the Shasta County operations of Mountain Copper Co., Ltd. His address is Matheson, Calif.

Howard E. Williams, chief draftsman for the Calumet & Hecla Consolidated Copper Co., retired on July 1.

Reese R. Spencer, of Dundas, Ontario, has been appointed assistant to **Robert McIntosh**, mechanical superintendent for Calumet & Hecla Consolidated Copper Co., Calumet, Mich.

W. Burling Tucker, district engineer for the California Division of Mines in Los Angeles, Calif., has been appointed acting State Mineralogist to fill the vacancy left by the retirement on Aug. 1 of **W. W. Bradley**.

Dr. George H. Ashley, chief of the Pennsylvania Bureau of Topographic and Geologic Survey, retired on Aug. 31, at his own request. He is succeeded by **Dr. Ralph W. Stone**, who will serve from Sept. 1 of the current year to Dec. 31, at which time he also will retire. Dr. Ashley is in his 81st year and Dr. Stone will be 70 next November.

C. G. McLachlan, since 1928 mill superintendent of Noranda Mines, Ltd., Noranda, Que., was recently appointed general mill superintendent.

Lieut.-Col. H. D. Keiser, U.S.A. Corps of Engineers, has returned to his former duties with the U. S. Bureau of Mines at Washington, D. C.

Strathmore R. B. Cooke is now professor of mineral dressing at Minnesota School of Mines and Metallurgy

John Chipman has been made head of the department of metallurgy at M.I.T.

Carl Tolman, until recently head of the geology department at Washing-

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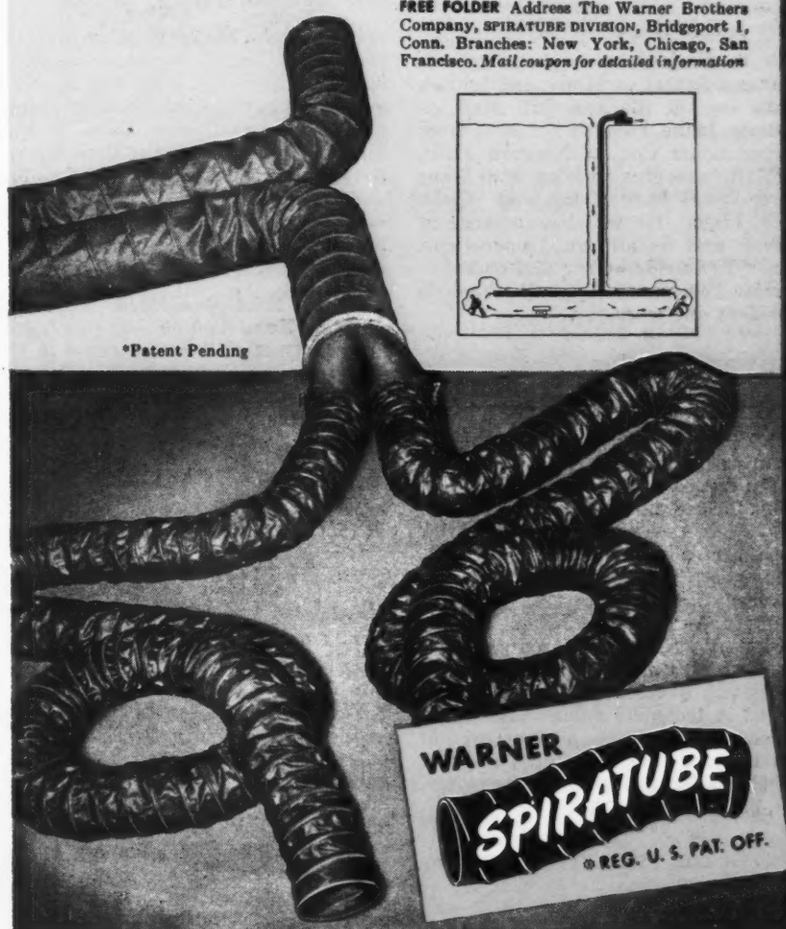

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ton University, has been made acting dean of the School of Graduate Studies at that institution.

Dr. John V. N. Dorr, accompanied by his grandson **Burr Hardon**, recently discharged from the Marines, returned to New York on Aug. 4 from a five weeks' tour of Europe.

Dr. R. S. Dean, who in 17 years with the U. S. Bureau of Mines rose to be chief engineer of the Metallurgical Division and then to Assistant Director, resigned from the Government service effective Sept. 1 to reenter private professional work. His office will be at 2041 K St., N. W., Washington, D. C.

Arthur C. Solom has become superintendent of the Fraser mine of Oliver Iron Mining Co. on the Mesabi Range.

R. B. McElwaine, consulting geologist and mining engineer, formerly with the U. S. Bureau of Mines, and **E. P. Mirelle**, have formed the M. & M. Exploration Corporation, to do contract drilling, examinations, and valuation, and to purchase non-metallic minerals. The organization's address is Box 127, Little Rock, Ark.

C. B. Hoskins, a graduate of the Montana School of Mines and for ten years on the Bunker Hill staff at Kellogg, Idaho, recently resigned from Carborundum Co., of Niagara Falls, N. Y., to accept a position with Hope Silver-Lead Mines, Inc., at Clark Fork, Idaho. He will have charge of milling and metallurgical operations. **Elmer T. Shields**, miner and operator, is mine foreman. **Albert M. Nash** is president and manager.

OBITUARIES

Walter S. Weeks, chairman of the mining department of the University of California and its retired marshall for public ceremonies, died in Berkeley, Calif., on Aug. 8 at the age of 64. Professor Weeks was a native of Chelsea, Mass., and was graduated from Harvard University in 1906. He was an expert on mine ventilation, and the author of several books on the subject as well as numerous articles on ventilation problems which have appeared in technical publications. Professor Weeks was a member of A.I.M.E. and the Engineers', Faculty, and Bohemian Clubs in San Francisco.

Charles Latham Lawton, general manager of the Quincy Mining Co., Hancock, Mich., died July 16. He was born June 20, 1864, at Auburn, N. Y. He was graduated from the Michigan State College and later studied at the Michigan College of Mines at Houghton, where he received his E. M. degree. He engaged in mining in a number of states before coming to Quincy in 1905 as general manager.

Charles H. Segerstrom, president of the Nevada-Massachusetts Co., at Sonora, Calif.; died on Aug. 2 at Sonora. He was a member of the A.I.M.E.

Edward J. Maney, long associated with the iron-mining industry of the Lake Superior region, died on July 20 at Duluth, Minn., at the age of 71.

Donald M. Rait, mining engineer and Chief of the Mining Section, Reconstruction Finance Corporation, died on July 28, aged 65, in Washington, D. C. Born at Two Rivers, Wis., he was graduated from the University of Minnesota in mining engineering in 1903. Shortly afterward, he joined the engineering staff of Calumet Arizona Mining Co., at Bisbee, Ariz., and rose to the position of superintendent of mines, a post he held until this company was merged with Phelps Dodge Corporation. Following a short period of service with the War Minerals Relief Commission of the Interior Department, he transferred in 1934 to the newly created Mining Section of the RFC, in which he held the position of Chief of the Section from 1942 until his death.

Charles A. Beck, of Miami, Okla., prominent Tri-State mine operator, died on Aug. 8. A civic and business leader and member of a widely known pioneer Ottawa County, Okla., family, Mr. Beck was head of the Beck Mining & Royalty Co., Beck Mining Co., Miami Mining Co., and for several years managed the Beck family's extensive holdings in the heart of the Picher mining field.

Sidney Eliot Henderson, of Baxter Springs, Kan., died on Aug. 9. A former contract driller who came to the Tri-State district in 1922, Mr. Henderson had been associated with Cameron & Henderson, Inc., since 1931 in the operation of several mining properties in the Picher area.

A LETTER

Mining Code Inadequate for Modern Prospecting

The Editor:

Your editorial on assessment work in the Engineering and Mining Journal for June touches on a matter of paramount interest for the mining industry, to wit: our outmoded federal mining code actually hinders the prospecting for and replenishment of the nation's ore reserves.

As you pointed out, next year will mark the 75th anniversary of the enactment of the present United States mining code, and it is timely that we should celebrate this anniversary by an investigation of the whole situation relating to acquisition and maintenance of mineral lands.

Our mining code may have been adequate in the bonanza days when valuable orebodies outcropped at the surface, but these days have vanished with our Western frontier, and our new substantial orebodies must be found by plumbing the depths of the earth. It is from blind or buried deposits that we must get our future ore supply. These will be most effectively found by application of all the scientific methods at our command. We need time and elbow-room wherewith to make a successful search along modern lines for these orebodies, and our mining laws give us too little protection in this regard. Our weapons for attack under scientific prospecting methods involve the use of geophysics and the application of broad geological concepts. Such methods are incapable of pin-pointing the location of orebodies. They merely point out areas in which conditions are favorable for search. Thus, we need new and intelligent legislation which will provide protection during search over large tracts of ground which our scientific prospectors tell us warrant actual exploration by drilling or underground development.

Once areas have been delimited for test, then the following methods should be adequate in satisfaction of discovery, assessment work, and maintenance of possessory right: namely diamond core drilling, geophysical surveys recognized as truly scientific, and valid geological surveys, provided, of course, that these are bona fide and can be so proved.

In this connection, a recent House bill has been proposed in which so called "Geophysical Surveys" would entitle anyone, or a company, to mark off large sections of public domain for prospecting. The intent behind the bill is praiseworthy but, as written, it would result in more harm than good, for it encourages every charlatan connected with mining to palm off some "doodle bug" as a pukka geophysical instrument and thereby stake tremendous areas of open ground.

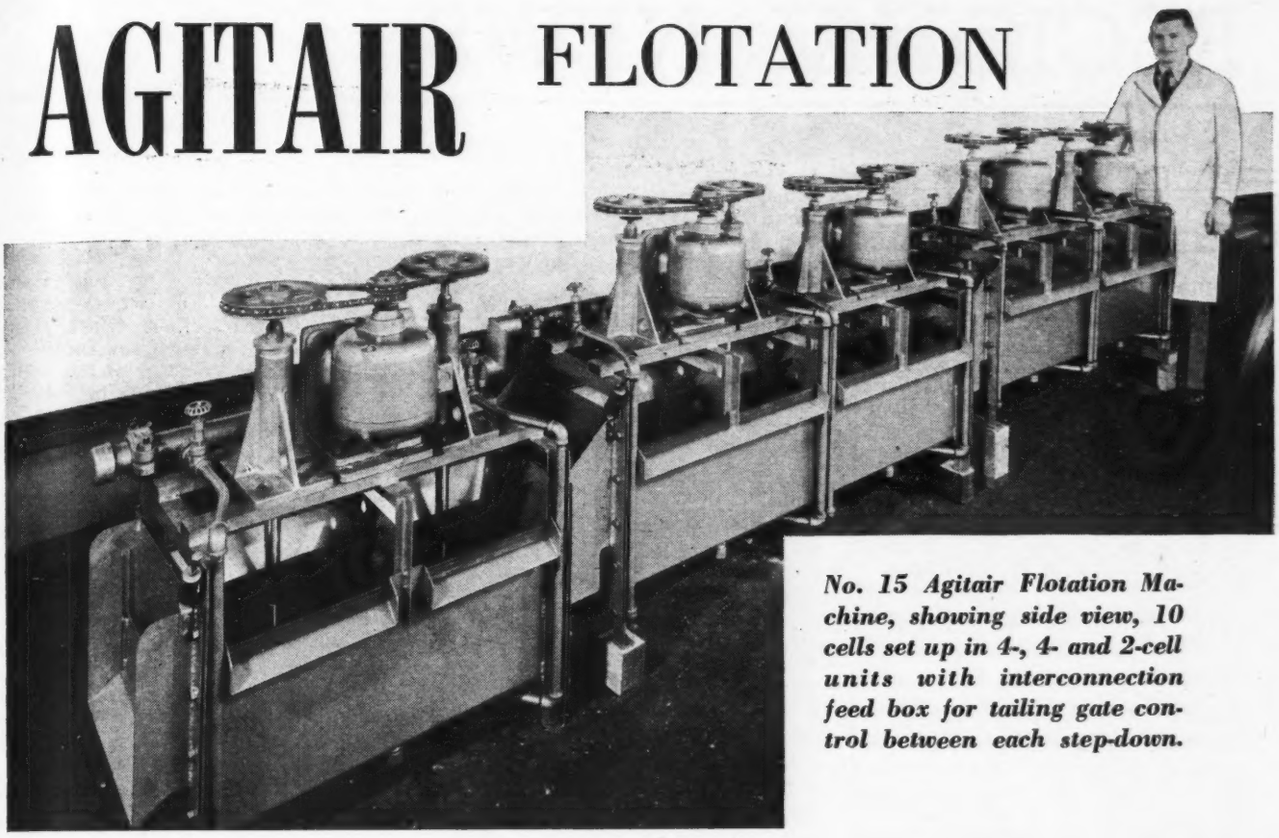
Possibly the first constructive step should be to assemble a *small* committee to work on a thorough revision of the whole structure of the mining code. Committee members might well be drawn from the mining industry—preferably that section which deals largely with replenishment of ore reserves; a member should be selected from Government and as well as one from our learned friends in the legal profession who are knowledgeable in the intricacies of mining law.

Certain it is that we are at a turning point in our national economy in so far as replenishment of ore supplies in this country is concerned. We must recognize this fact, and ponder it, and devise the legal machinery to the end that we shall adequately and efficiently promote the search for a vitally needed mineral supply.

D. M. DAVIDSON,

Minneapolis, Minnesota
August 6, 1946

AGITAIR FLOTATION



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REGIONAL NEWS

CALIFORNIA

Copper production from Walker mine to resume—New activity in Placer County

★Work to develop the continuation of the main vein below the main tunnel is in progress at the Italian mine at Drytown, Amador County, acquired recently by Geo. L. Gaskell, president of Colorado Zinc Co., and H. G. Schweiger. Milling facilities at the property consist of a small flotation plant which is to be enlarged later.

★Installation of mining machinery has been completed and a cyanide plant is ready for operation at the Hayden Hill gold mine in the Hayden Hill district of Modoc Countys controlled by the Gold Eagle Mining Co., of Spokane, Wash. The mine was operated by the Hayden Hill Gold Mining Co. until shut down by L-208, and the tonnage of available milling ore has been substantially increased by recent development work. F. H. Brown, manager, directs operations.

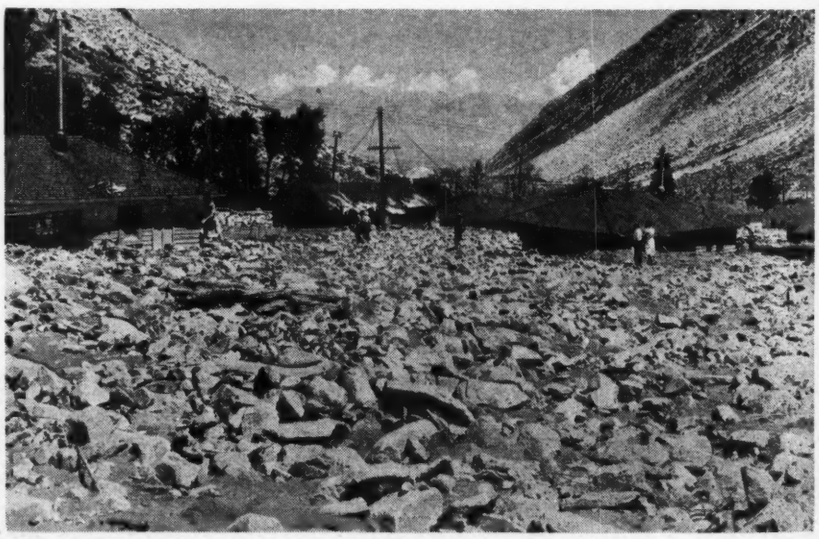
★California Keystone Mining Co., operating a large gold placer property by hydraulic methods at Hobo Gulch near Helena, Trinity County, has installed a 3-ft. conveyor belt to remove boulders from the pit and a 360-hp. Diesel engine to furnish power for two 10-in. pumps supplying water to hydraulic giants. Large boulders are moved by a bulldozer unit. E. Frank Trubey is president and general manager, and six men are currently employed under the direction of John D. Hubbard, vice president and superintendent.

★Sierra Mines, Inc., which reopened last year the Cain holdings at Bodie, Mono County, formerly operated by Roseklip Mines, of San Francisco, plans to rebuild the 500-ton mill destroyed by fire recently and used for pilot plant operations. S. B. McCluskey, metallurgical engineer, is consultant and general manager of Sierra Mines.

★Production of copper is scheduled to start shortly at the Walker mine near Portola, Plumas County, now operated by Plumas Mining Co., R. P. Wilson, president. Mine workings and surface structures are reported to have been rehabilitated, and the 2,500-ton concentrator is ready to receive mine output. A contract has been signed with Pacific Gas and Electric Co. to furnish electric power for the mine and mill. The 9-mile aerial tram has been abandoned in favor of truck transportation. The property was acquired by Wilson last fall, and the new company was incorporated early this year. About 100 men are employed currently.

★To iron out the controversial matter of proper restoration of land after gold dredging, State Senator, H. E. Dillinger, whose regulatory legislation introduced last year was defeated by the Legislature, has appointed a committee composed of district attorneys, representatives of dredging companies, and of farm groups to draft a uniform ordinance to regulate gold dredging, following a meeting called after the U. S. District Court in Fresno declared sections of a Merced County anti-dredging ordinance unconstitutional. Members of the committee headed by Sen. Dillinger include Robert M. Searls, San Francisco

(*Continued on page* 102)



THESE PICTURES DEPICT THE DESTRUCTION CAUSED BY A MUD FLOW which descended on Upper Scheelite, California. This is the Pine Creek village of houses attached to the Bishop mine of United States Vanadium Corporation. The houses were engulfed by a mixture of mud and rock 6 to 9 feet thick, which smashed up 17 of the 29 houses in the community on July 24th. The mud flow was caused by a cloudburst higher up the canyon. The material advanced slowly and no lives were lost.

Future Mineral Needs

(*Continued from Page* 53)

nomic conferences sponsored by the United Nations, but the mineral industry is not meeting the problem as a whole.[1] Negotiations should not be left to chance in the hands of Government officials without the mineral "know-how." The entire mineral industry should *now* be participating in over-all planning for our future needs.

In urging more attention to the foreign aspects of the problem of mineral supply, I do not mean that we should lessen our efforts in the domestic field. I have no fear that we will, because of the vast stores of initiative and driving power inherent in our mineral industry, and because of the intelligent aid of federal and state agencies. I merely wish to emphasize the fact that we are not yet bringing to the new problem organized attention.

The security phase needs special attention. In the first World War we found, to our surprise, that we did not have enough minerals of our own. In the second World War the lack was still greater. In fact, the winning of the war required a world-wide mobilization of mineral resources and control of the sea. Regardless of the atomic bomb, or perhaps even because of it, it seems prudent to assume that the winning of another World war will require the mobilization of supplies far beyond the resources of any country on the globe, and, of course, continue control of the sea. Such a mobilization will require a vast international build-up planned and started well in advance. It will be impossible to accumulate sufficient stockpiles and at the same time keep industry going. Stockpiles we should have as a cushion for the early stages of war, but the big problem will be access to production from mineral centers of the world.

Self-interest will, of course, be the primary motive of our effort to secure adequate mineral supplies, either for industry or for war, but if we succeed there will not be enough mineral supplies left in the world to back up the threats of recalcitrant nations. The very existence of the plexus of international understandings necessary to insure supplies, whether reached through the United Nations or independently, should be a real deterrent to war. Self-interest and prevention of war become synonymous.

[1] Leith, C. K.: "Principles of Foreign Mineral Policy of the United States," *Mining and Metallurgy*, January 1946, pp. 6-17.

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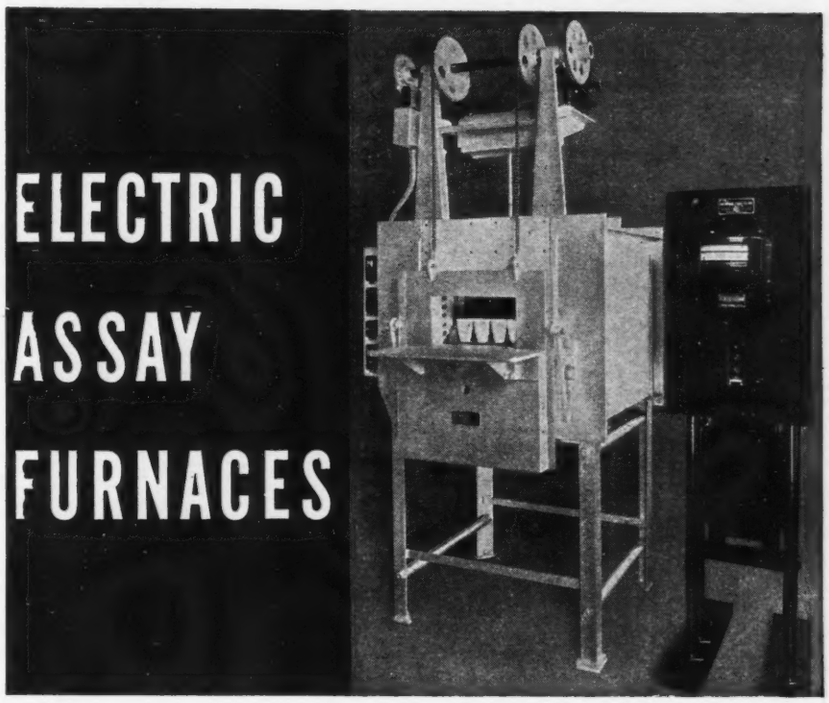

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California *(Continued)*

mining attorney; George Sehlmeyer, State Grange master; Von T. Ellsworth of the California Farm Bureau; Joseph Hunter of the County Supervisors Association; Fred Hartzell, Associated Sportsmen; J. Q. Brown, Sacramento district attorney; C. H. Adams, Merced district attorney; L. A. Cleary, Stanislaus district attorney; Gard Chisholm, Amador district attorney; E. J. Reagan, Trinity district attorney; Chas. E. Johnson, Siskiyou district attorney; and Seth Millington, of Gridley, former assemblyman.

★Alex Rossi, of Sacramento, and associates have reopened the Morning Star placer property at Iowa Hill. Placer County, worked on a substantial scale more than 50 years ago. The property covers a part of the Iowa Hill gravel channel and was exploited by drift gravel methods.

★In the Forest Hill area of Placer County several gold properties are active, and Pacific Gas and Electric Co. is building a 60,000-volt power line to Forest Hill from Weimar. Horseshoe Bar Mines has placed a dragline dredge in operation near Forest Hill; the Drummond mine is under development, and Baker Mining Co. is planning to resume work at its property situated in the area.

★The Perlite Corporation of America, a Nevada corporation which for several years has exploited the perlite field, has developed a process to expand or "pop" this obsidian character ore, and is producing the material on a commercial scale at its Chula Vista plant. A second plant is projected for construction at Los Angeles.

★The regional office of the National Labor Relations Board has ordered a hearing to examine issues involved in a request submitted by Mother Lode Mine and Mill Workers Union No. 839, CIO, for an election among workers at the Idaho Maryland mine to determine collective bargaining representation.

The jurisdiction of NLRB is challenged by officials of Idaho Maryland Mines Corporation in view of a decision handed down by the United States Appellate Court six years ago to the effect that gold mining companies are not engaged in interstate commerce and hence are not subject to rulings of NLRB. This decision is considered incontrovertible by all California gold operators.

Recently a two year contract was negotiated between the company and the Mine Workers Protective League, providing for an 18½c. per hour wage increase. Previously a request by the CIO local for a meeting to negotiate an agreement was refused by the company.

Neil O'Donnell, general manager, stated that the Idaho Maryland company would be represented at the NLRB hearing.

OREGON

Reynolds will operate Troutdale aluminum plant under five year lease

★Golden Dredging Co., a partnership among George England, Harry Morse, Thomas Harris, Frank Kendall, and Jenkins Pryse, has moved its plant from Pine Creek in Baker County to the middle fork of the John Day River near Caribou Creek. Equipment consists of conventional 1½-cu. yd. dragline and washing plant.

★Associated Dredging Co. has moved equipment from Lower Burnt River, Baker County, to Vincent Creek, northeast of Austin in eastern Grant County. Equipment includes a ¾-cu. yd. Lima shovel and floating washing plant. This company is a partnership composed of W. A. Hilliard, Ira Pound, J. D. Oscar, Elwood Welch, and Harry Welch. The ground on Lower Burnt River is still being retained by the company, which is currently doing further testing work by drilling.

★The Double H mine, formerly the Lucky Boy, located about two miles north of the town of Rogue River in Jackson County, is being explored by a group headed by G. S. Holmes and R. J. Howard. John Johnson, Grants Pass, is superintendent.

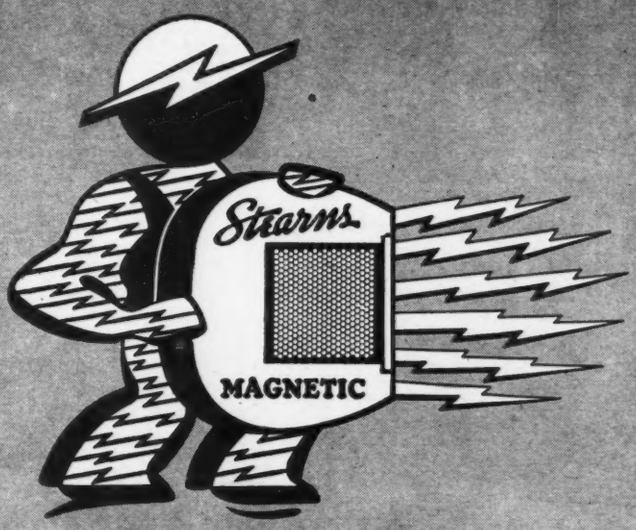
★Reynolds Metals Co. leased for five years the Government's $13,228,600 aluminum plant at Troutdale, in early July. According to E. J. Appel, manager, the first potline would start production in August with 300 men employed. As the reconditioning of other lines proceeded, 700 to 800 men would be employed.

WASHINGTON

Big Lake exploration tunnel cuts 18 ft. of ore—Talisman to operate 100-ton mill

★The Tacoma smelter is now receiving gold ore concentrates from the mines of Tulsequah, B. C., near Juneau, Alaska. A 350-ton shipment in 100-lb. gunny sacks recently arrived. The Alaska Transportation Co. brings the ore as far as Seattle, and according to S. J. Swanson, general manager, it will be moving steadily from July through September. The ore is taken by barge down the Tulsequah and Taku rivers when they are free of ice and loaded on cargo ships off Taku Glacier, near Juneau.

★Big Lake mine, located 13 miles southwest of Kettle Falls, 1,000 ft. above the Columbia River level, and 1,400 ft. from the Colville P. U. D. electric line, in extending its 900-ft. exploration tunnel has crosscut 18 ft.



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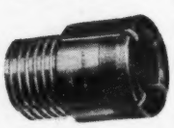

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Washington *(continued)*

of lead- zinc- silver- and gold-bearing ore at a depth of 600 ft., according to Will Everett, president of the company. Much of the ore is of good milling grade. The crosscut tunnel is being extended, and drifting on the vein has been started. Five men are employed at the property.

★The ferrosilicon plant at Rock Island was to be surveyed this summer by a large company to decide whether phosphate fertilizer could be produced and whether this concern could be purchased cheaper than to construct a new plant, according to information from the War Assets Administration. The WAA turned down one bid for the property because the bidder planned to dismantle the plant for export.

★General Electric Co. was scheduled to take over responsibility for operating the Hanford plutonium plant, at Richland, from E. I. du Pont de Nemours and Co. on Sept. 1. The company will conduct an extensive research program on peacetime uses of applied atomic energy. Workers at the plant have been reduced from 6,000 to 5,000 during the past year. Increased process knowledge has caused the atomic mass to be made at the same speed with less personnel. According to Lt. Col. Frederick J. Clarke, Area Engineer, manufacturing is continuing at the government-owned plant at the same rate as during the war.

★The second potline went into production at the Mead aluminum plant July 31, and according to Norman L. Krey, works manager, the third line was expected to be in operation by about Aug. 23. General Machinery Co. was employing 500 men in July installing copper in the potlines and by October it is expected that all six potlines will be operating.

★In July, the Trentwood mills produced 4,020,000 lb. of finished aluminum sheet. The melting room was the most active, according to John R. Meek, works manager, with three shifts working seven days a week. The schedule which has been set is 80,000,000 lb. of finished aluminum sheet by the end of the year, as follows: 8,000,000 lb. in Aug.; 12,000,000 lb. in Sept.; 16,000,000 lb. in Oct.; 20,000,000 in Nov.; and 20,000,000 lb. in Dec. First shipments went to California points, followed by shipments to other coast points, and by August, midwest and eastern manufacturers were receiving shipments. The Trentwood mill is making all types of sheet of different gauges and alloys for the first time. Kaiser's two plants are employing over 1,500 persons.

★Wray Farmin, president of Northwest Mining Association, commented that the 90.5c. price for silver will help mining generally but said the manpower shortage must be solved before production can be increased. He spoke of this price as "a floor

rather than a ceiling" and predicted that as soon as the Treasury sells its limited amount of free silver, the price will rise quickly.

★According to reports from several of the smelting companies, in late July, information regarding the costs for remelting silver bus bars had been sought. It is believed that Treasury officials contemplate returning the $59,000,000 of silver bus bars stored at the Mead aluminum reduction plant, at Spokane, to the U. S. Treasury or to its vaults at West Point, N. Y. This value is based on 71.1c. for the metal. The bars were loaned by the Treasury for use in place of copper during the war when that metal was unobtainable. The silver was used in different shapes, but when it is stored in the Government's vaults it must be standard bullion bar size.

★The Talisman mine, near Laurier, on the Kettle River, expected to put its new 100-ton mill into operation in August, according to John Sims, of Spokane, manager. He said the crew of 10 men would be increased to 25 as soon as the mill started operating. Describing the orebody, Sims stated that the ore assayed 4 percent lead, 8 percent zinc, 2 percent copper, and about 12 oz. of silver per ton. A 3,000-ft. tramway from the tunnel portal to the mill has been completed.

IDAHO

Development resumed at Sunshine Consolidated—A. S. & R. may operate Vulcan property

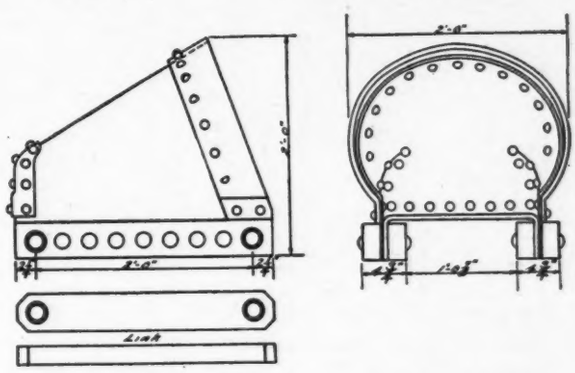
★Although Idaho's silver production dropped 21 percent in 1945 below the record for the previous year, the state is still by far the nation's largest silver producer, according to the U. S. Bureau of Mines. During 1945, Idaho produced 26 percent more silver than Montana, which was the second largest producer. The reduced output of Idaho mines was due entirely to an acute labor shortage.

★Sunshine Consolidated Mining Co., south and west of the Sunshine mine, has resumed development work after being closed since 1941 because of the Government ban on silver mines which produced no other important metal in quantity. Since this ban was lifted the mine has remained closed because mine labor was not available. During the closed period the Sunshine Mining company purchased a half interest in the property under an agreement whereby Sunshine has charge of all development and mining work and divides the profits 50-50 with Consolidated. The development is on what is known as the Yankee Girl vein, 1,000 ft. south of the Sunshine vein system; development has been from the Sunshine 3,100-ft. level. Sunshine has the same vein opened in its own ground for a distance of about

Manganese Steel Used in Dredge Buckets for Half a Century

Gold was first produced by bucket dredges in the United States in Montana in 1896. The sketch shows a dredge bucket with manganese steel bushings built by Risdon Iron Works for the first successful gold dredge in California, which started operating in 1898. As early as 1903, manganese steel bucket lips were used.

Since the bucket is an important part of a placer dredge, much consideration has been given to its design and the materials employed by placer operators and dredge builders.



3 cu. ft. dredge bucket with manganese steel bushings. Built for the first successfully operated gold dredge in California, 1898.

The past half century has been marked by noteworthy advances in bucket design and by the increased use of "the toughest steel known" to combat the impact shocks and severe abrasive wear to which dredge buckets are subjected.

Amsco-Whisler Rivetless Lip Dredge Bucket. (Patented)

Improvements in dredge buckets added up eventually to the Amsco-Whisler rivetless lip bucket shown in Picture 1028. These patented all-manganese steel buckets have seen over ten years of continuous service in every gold or tin dredging country in the world, under all kinds of digging conditions. Yet there has not been one replacement because of lip failure. This up-to-date, efficient and easily maintained bucket and the tough, strong work-hardening manganese steel of which it is made are an unbeatable combination.

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Idaho *(Continued)*

700 ft., all of which is in 20 oz. silver ore of mineable width. Several hundred feet of drifting has been done on the vein in Consolidated ground, part of which is in pay ore. The new development is said to be higher grade ore and in larger quantity.

★According to Albert M. Nash, manager, the Hope Silver-Lead Mining Co. at Clark's Fork, Idaho, is preparing to resume milling operations after a temporary suspension, during which time a new operating shaft has been sunk and new ore bodies developed in a vein separate from the original Hope ore bodies.

★The Sunshine Mining Co. has closed its manganese mining operations at the Crescent mine near Port Angeles, Wash., after producing 28,000 tons of 50 percent manganese ore, all of which was purchased by and has been stockpiled for the United States Government.

★The Garfield Mines Co. has leased the old James mining property in the Muldoon district near Hailey and will operate it in connection with the company's Eagle Bird mine. The company has recently purchased and installed a new Schramm diesel air compressor unit and a portable electric light plant. On commencing operations this spring the company flew a crew of miners to its isolated camp by airplane because of snow conditions.

★The Twin Peaks Mining Co., on Rattlesnake Creek, near Salmon, has recently started operating a 50-ton milling plant on silver-lead ore accumulated from development operations last winter. Temporarily, the company intends to mine and mill only sufficient ore to make the development self-supporting.

★Silver Dollar Mining Co. is drifting both east and west on the Chester vein system on the 2,400-ft. level. The east drift is toward the Polaris Mining Co.'s Chester claim and the west drift toward Silver Chieftain's ground. Silver Dollar holds a heavy interest in Silver Chieftain and intends to thoroughly develop this ground. West of the Silver Chieftain the Chester vein has developed the largest and richest silver-bearing orebody in the Coeur d'Alene district.

★The Silverton Mines Co. has made arrangements with the Washington Water Power Co. for the extension of high tension electric power line to the Silverton No. 3 tunnel, where the company is installing machinery preparatory to sinking a shaft to a depth of 1,000 ft.

★Silver Syndicate Mining Co. is driving a crosscut south from the Sunshine company's Jewell shaft to open the Silver Syndicate vein on the 3,100-ft. level, according to W. M. Yeaman, president of the company. The operation is under the management of the Sunshine company, who own a half interest. At the same time the vein is being prospected by drifting on the 3,700-ft. level, where it shows a four to six feet width of ore which averages about 8 percent lead and 40 to 50 oz. silver per ton. On the 2,700 and 3,100 levels Silver Syndicate owns several hundred feet in length on the western end of the rich Chester oreshoot now being mined by Polaris, Sunshine and Silver Dollar. The ore in the Silver Syndicate part of the vein is fully developed and ready for mining.

★Idaho's only copper mine, the Empire Copper property at Mackay, is being reorganized under the name of the Custer Copper Corporation by William P. Barton, David E. Bell, James L. Black and Margaret Stanley Barton, all of Mackay, and Myron H. Halpern, of Boise. Barton was former mine superintendent at the Ima tungsten mine at Patterson, and operated the Empire Copper in 1940. The mine was at one time a large producer of crude copper ore and has a recorded output of $10,000,000. The present company intends to install a milling plant and treat the lower grade ores.

★Lucky Friday Silver-Lead Mining Co., at Mullan, has opened several streaks of high-grade silver-lead ore in a crosscut on the 1,400-ft. level. Four streaks of ore have been cut so far, varying from six inches to a foot in width, and assaying 78 oz. in silver and 68 percent lead. The crosscut is still in vein matter and is being continued. The company has shipped over $200,000 worth of ore in sinking the shaft to this depth. The last production was from the 1,000 level, from where 1,700 tons of mill feed netted $30,000. The Lucky Friday shaft is a three company affair and is to be used by two other companies, the Hunter Creek and Lucky Friday Extension. All the development is in charge of the Lucky Friday management. It will be necessary to drift 1,000 ft. to reach the Hunter Creek ground and about the same distance to the Extension. A north crosscut is now being driven toward the Extension property.

★Federal Mining & Smelting Co. has transferred its mine dump milling operations from No. 6 to No. 3 dump, which is higher grade. The company has milled 700 tons daily from the No. 6 dump for the past three years because it could not find sufficient men to operate the mine.

★Bunker Hill & Sullivan Mining Co. has declared its third quarterly dividend of 25c. a share for 1946, payable September 3 to stock of record August 6. The payment amounts to $327,000 and brings the total for the current year to $981,000 and the grand total to $60,876,527.

★The Douglas, Callahan Consolidated and Denver Development Co. zinc-lead

mines in this district have been closed because of the suspension of the "A" premium zinc price June 30. Restoration of the price, retroactive to June 30, has not induced any of the three companies named to resume operations. They claim there is no ready market for zinc concentrates.

★The Ione Mining Co., engaged in developing a lead-silver mineral belt about 15 miles southeast of Murray, has enlarged its holdings by purchasing from Mr. and Mrs. Louis F. Groesbeck, of Murray, the Pirate Chief group of adjoining claims. Both the Ione and Pirate Chief are on the same vein, which shows an outcrop of high-grade lead-silver ore at the surface. The Ione is developing the ground with a long crosscut tunnel through the lower workings of the Bear Top mine. The Ione and Pirate Chief are said to be in a quartzite belt, which the Ione company expects to show deep-seated ore.

★The American Smelting & Refining Co. is reported to have agreed to take over the operation and development of the recently organized Vulcan Mining Co. on the basis of a 50-50 division of profits. The Vulcan company recently purchased 58 mining claims in the silver belt just west of Wallace from the Callahan Zinc-Lead company. The officers in the Vulcan company are Joseph T. Hall, New York, president; H. J. Hull, Wallace, vice-president; Alfred Ogden, New York, secretary; E. A. Salo, New York, treasurer, and Margaret Denny, Wallace, assistant secretary-treasurer. The Vulcan property is undeveloped, but AS&R is said to have promised the expenditure of $600,000 in sinking a shaft to a depth of 3,000 ft., and other development.

★Callahan Consolidated Mining Co. is diamond drilling the Riverside copper property on the Little North Fork of the Coeur d'Alene River, on which the company holds an option. The surface showing is chalcopyrite.

★The Thomas Mines Co. has started sinking a shaft on a promising vein of silver-lead ore on property adjoining the Dayrock mine in Nine Mile Canyon north of Wallace. The recent discovery of a major sized body of high grade silver-lead ore on the 650-ft. level of the Dayrock mine has intensified prospecting interest in this particular section.

★The recent discovery of high grade ore at the Silver Bowl property in Kellogg continues to improve as drifting is advanced on the vein. The company has drifted about 40 ft. on ore since the discovery, showing three feet of high grade and six feet of milling ore. Hand sorted ore carries 58 percent lead and 14 ounces in silver.

★The Livingston Mines, Inc., a newly organized company with headquarters in Seattle, Wash., has purchased the Livingston mine, 68 miles from

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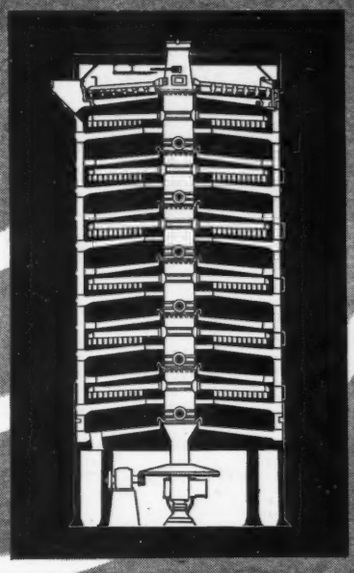

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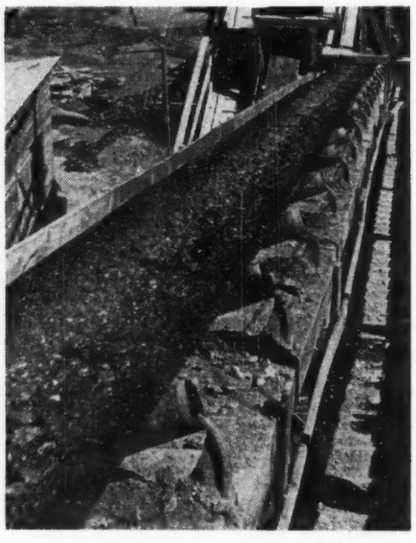

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Idaho *(continued)*

Mackay, Idaho, and the property is being put into shape for immediate shipments of lead, zinc, and silver ore mined from a vein on the 2,400-ft. level. Officers are J. R. Lewis, president, and Howard Crow, secretary-treasurer, both of Seattle, with C. A. Tout, of Victor, Mont., as general manager.

MONTANA

New company to develop claim group at Virginia City—Ruby Gulch resumes milling

★P. Evan Oscarson, until recently district engineer at Spokane, Wash., for the U. S. Bureau of Mines, was in Montana in July outlining a development program for the Silver Lode Gold Mining Co., a recently formed Washington corporation, which has acquired twelve claims at Virginia City from the Marietta Mining and Milling Co. The Marietta company received 250,000 shares of Silver Lode Gold stock. Ted Johnson of Manson, Wash., an orchardist, is president of the new company; John Hatch, of Spokane, vice-president; and Wellman A. Clark, also of Spokane, is attorney for the company.

★The Elkhorn Mining Co., Elkhorn, Jefferson County, has unwatered to the 450 level of the old workings of the Elkhorn mine, which leaves dry the new operations 225 ft. in the footwall territory of the original Elkhorn incline. Wade V. Lewis, manager, states: "We are now down vertically about 130 ft. and have a full floor of lead-silver-zinc ore."

★Grant-Pacific Mining Co., Virginia City, Madison County, has been incorporated with capitalization of $2,000,000, by Walter H. Myers, Virginia City; John Cloke, C. L. Peterson, J. W. Myers and Bert Haynes, all of Butte. Walter H. Myers, president and general manager of the new company, states: "This company will purchase the U. S. Grant Mining Co., and consolidate it with the Easton-Pacific and Alameda-Bamboo Chief group of claims. The Easton-Pacific has a record of 19 profitable years of production prior to 1914. The Alameda-Bamboo Chief has a record of producing quantities of high grade ore. The U. S. Grant Mining Co. has been operating for two years and is now producing 250 tons of gold-silver ore per week and has just paid a 35 cent dividend on 45,000 shares of stock."

★Volash Block & Tile Co., Dillon, Beaverhead County, has been incorporated, with capital of $50,000, to mine volcanic ash and cement and process these materials into building blocks and other finished products in the Fry-

ing Pan basin, six miles southeast of Dillon. Electric power will be obtained from a REA line. Officers and directors are Reed Featherly, president; R. M. Barret, vice-president; John Collins, secretary and treasurer, and Vern Nelson, all of Dillon. William Logan, Dillon, formerly president of the Beaverhead County Mining Association, is manager of operations.

★Silver Butte mine, 42 miles south of Libby, Lincoln County, is operating a 50-ton mill, concentrating zinc-lead-silver-gold ores. William Curts, Malta, is the principal owner. Ivor Anderson is in charge of operations and Andrew Prader, Spokane, Wash., is consulting engineer. The property was operated many years ago by the Kentucky-Vermillion Mining Co.

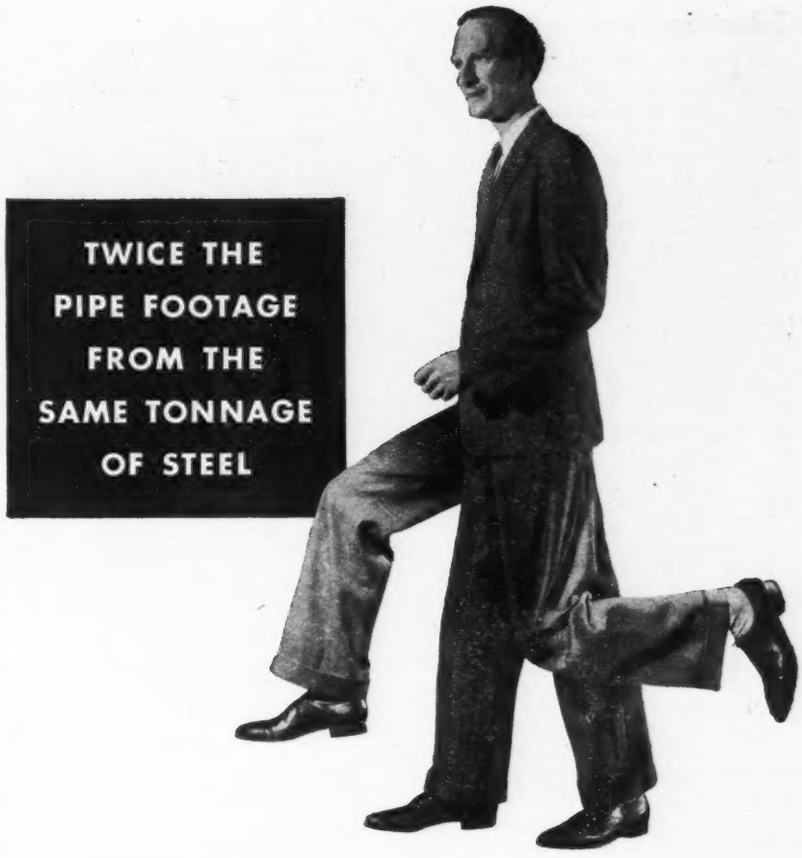
★Ruby Gulch Mining Co., Zortman, Phillips County, recently resumed milling operations, treating low grade oxidized gold ore by cyanide leaching. Edgar A. Scholz, Whitehall, is acting manager and A. F. Rambosek, Butte, is superintendent.

COLORADO

Damage from Cresson cave-in placed at $100,000—Idaho Springs mines reopen

★Men and equipment of the Cresson mine at Cripple Creek, owned by the Golden Cycle interests, have been working for several weeks to remedy the damage caused by a cave-in on July 22. On the evening of that day, after work had stopped and all but two men had left the mine, the ground started crumbling under the blacksmith shop, and by morning the shop and all its contents were resting at the bottom of a hole some 400 ft. deep and 100 ft. across. The two men in the mine, James Kauffman and Everett Fay, skip operators, were brought out before the cave-in reached its height. The blacksmith shop was attached to the neighboring machine shop by an I-beam, and this threatened to drag the machine shop into the crater. Bob Welch, a company engineer, stood on the edge of the crater to sever the beam with a cutting torch.

The main shaft of the mine, though only 50 ft. away, was not damaged. This fact was ascertained later by an inspection party headed by A. H. Bebee, vice president of Golden Cycle, and including John Stark, superintendent of the Cresson, Wesley Moulton and Alfred Bebee Jr., mining engineers, who also learned that the apparent cause of the cave-in was the weakening of the walls of a huge stope below the 400-ft. level due to water-seepage. As the material above collapsed into it, material above that gave way progressively until the surface was reached. The material falling into the crater had in turn col-



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Colorado *(Continued)*

lapsed stopes and tunnels below, until the ground was solid from the bottom of the crater to above the 800-ft. level.

After the first frantic work of removing everything salvageable from the path of the cave-in, plans were laid for filling the hole. A dragline and bulldozer were put to work at once, in three shifts. It was estimated at least 100,000 cu. yd. of fill would be needed. This was available nearby in the form of fill from a dump on which the garage, car barn and a shed stood. These buildings were moved. It was found later necessary to move the steel-sharpening shop, which stood in the way of the dragline, and also was menaced by continuous small crumblings of the crater-side.

Total damage, including the work of restoration, was estimated at about $100,000.

Mr. Bebee said that although the cave-in had been a very serious and costly accident, the company is fortunate in that it had not affected the shaft. Some 26 groups of lessees in all have been working in the mine, besides the mine's own operating force. The Cresson, one of the largest and historically most productive of Cripple Creek mines, had been closed for three years because of Order L-208, and had only reopened on April 1, 1946.

★Arthur Portenier and associates have leased the Silver King group of claims in North Spring Gulch, two miles west of Idaho Springs. The property includes an 800-ft. tunnel and a 500-ft. drift on the vein. The ore is lead-zinc-silver, and the vein is described as two to five feet wide. This is one of the many claims around Idaho Springs that has not been worked since "the old days." Machinery and other equipment is being moved in.

Portenier's associates include Cecil Lytle, Leonard Abbott and David Kingery. For the past several months they have been developing the Franklin mine, in Virginia Canyon, which they equipped with machinery and from which considerable ore was produced before they disposed of their lease to William L. Condon of Denver.

★Homestake Le Roi Mining Co. has been formed by George F. Schott and associates, and has taken over the Edwards Gold Lode claims in the Spring Gulch Coral district, near Idaho Springs. They are planning a program of exploration through the two shafts and a tunnel already available. Equipment has been purchased and installed. Schott is president of the company as well as general manager in charge of mining operations. C. W. Lerchen, a veteran of Clear Creek mining, is vice-president and a director, and R. J. Fooks is secretary-treasurer and also a director.

Claude Garnett is associated with Schott in the purchase of the M. and E. mine in Spring Gulch, south of Idaho Springs, near Chicago Creek, and a crew under Garnett's direction has been repairing the buildings, installing a compressor and other equipment and readying the mine for production.

★Idarado Mining Co., which operates the Treasury Tunnel property near Ouray, has signed an agreement with the United Mine Workers of America covering its entire working force. Treasury is now one of the larger mining operations of the state.

The contract includes maintenance of membership, the checkoff, vacations with pay, a wage increase of 14c. an hour, a 48-hr. week, and shift differentials. The agreement is retroactive to July 1, 1946.

★Consensus of Colorado mining leaders is that 90.5c. silver will make no one rich, but will provide an impetus which will keep mining of complex ores, containing silver, at a higher level than otherwise.

B. T. Poxson of Emperius Mining Co., at Creede, president of Colorado Mining Association, said it was a "break-even proposition." He said costs have been running 92c. an ounce of silver produced at Emperius, which has only a small production of other metals.

J. Paul Harrison, Colorado manager of A.S.&R., said the new price would mean about $40,000 monthly additional revenue in the Leadville district. He said it would help smaller mines and might stimulate some additional exploration by larger operators. Oscar H. Johnson, of Mine and Smelter Supply Co. and Idarado, said it might keep the mines going if premiums went off lead and zinc.

★A three-day fire destroyed the tipple and other mine buildings at the Monarch mine north of Cotopaxi, and followed down the main shaft on timbering. No one was injured. The Monarch, of which T. H. Sackett is president, produces lead, zinc and some gold and silver. Repair work is under way. Loss was not estimated, but was large.

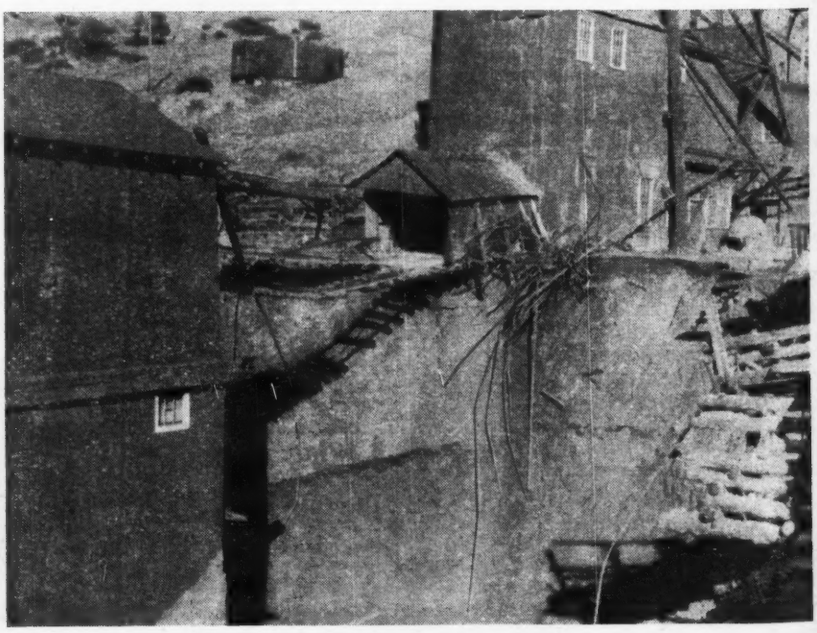
★Gold deposited at the Denver mint in July totaled 48,354 oz. worth $1,692,395, compared to 4,186 oz., valued at $146,526, in July of 1945. A large part of the increase was from Colorado operations.

★Lessees on the Elkton mine at Cripple Creek, down the hill from the Cresson, sent one truckload of gold ore to Colorado Springs which settled at 25 oz. or $875 a ton. Other loads were less rich, but profitable. Lessees are Borgeson and Simpson Owen, brothers. They are working through the Raven-Beacon tunnel.

K. K. Inskeep, Fred Polkinghorn and Lloyd Kruger, of Victor, who have leased the Commonwealth from Gold Mines, Inc., report sludge from diamond drilling operations is running up to 5.15 oz. The Commonwealth has been closed down since 1939. The trio has also leased the adjoining Dan McDonald property.

★Golden Cycle Corporation is build-

THE OREHOUSE, LEFT, AND THE MAIN MINE-BUILDING, UPPER RIGHT, are shown beyond the crater created by the recent cave-in at the Cresson Mine, Cripple Creek, Colo. The mine blacksmith shop, which stood directly in the foreground, is now at the bottom of the crater, which attained a size of 100 ft. across by more than 400 ft. deep. Work of filling in the opening has taken several weeks. Note shadow of the rails from mine-house to orehouse, left center. These rails later gave way and fell into the pit.



ing a $50,000 lime processing plant at its limestone quarries north of Colorado Springs. A. H. Bebee Jr. is in charge.

★E. K. Maillot is in charge of test drilling on the Hallenack-Williams placer, 12 miles south of Leadville. Goldfield Consolidated Mines Co., of San Francisco, which has an option, is seeking to learn what area may be profitably dredged.

★The Gol-Dreg Placer Co. is preparing for operation on French Creek on property leased from E. M. Cooper of Denver. Lawrence Kellogg is manager. A floating unit is being prepared that will handle 90 cu. yd. of gravel hourly.

★The Bureau of Mines oil shale mine, west of Rifle, is ready for production, and will be able to supply shale at any time that the retort plant is able to receive it. The mine is laid out on a scale that would permit stepping up production to 1,000 tons daily if the need arises. Change house, office and compressor building at the mine are nearing completion. The 50 housing units are almost ready.

UTAH

Operators Association opposes price control — New Park has record half-year earnings

★A special session of the Utah State Legislature Aug. 10 adopted a joint resolution which will submit to the people at the November election a constitutional amendment for a State fund to underwrite 75 percent of the cost of a minimum school program. The measure is opposed by the Salt Lake City Chamber of Commerce on grounds that it will place too heavy a tax burden upon industries and tend to prevent industrialization of the State anticipated with peacetime operation of the $200,000,000 Geneva steel plant. Property owners and others also are opposing the measure because of the additional burden it would place upon the State. Another recommended constitutional amendment favoring taxation of oil, gas and some mineral production was defeated.

★Return to an OPA-dominated economy is a blow at free enterprise, James K. Richardson, manager, Utah Metal Mine Operators' Assn., asserted in a public statement issued July 25.

Although one old mine had shut down with the temporary demise of OPA June 30, all other Utah metal mines had continued to operate, anticipating either that strong demand for non-ferrous metals would induce price increases sufficient to pay production costs or that production subsidies on high cost producers would be restored by some Government agency.

★New Park Mining Co., Keetley, re-

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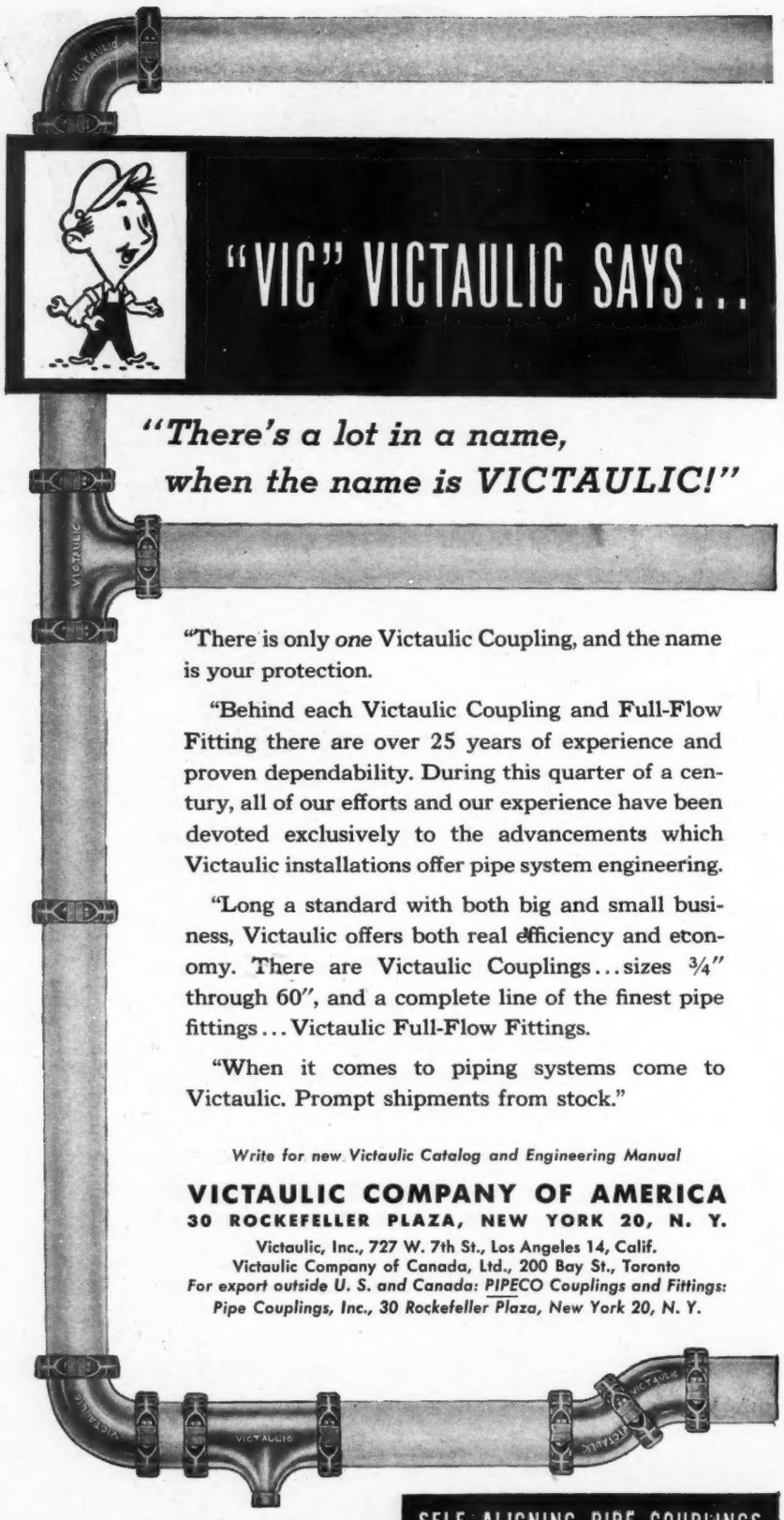
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Utah *(continued)*

corded a net income of $408,214 during the first half of 1946, making this the most profitable such period in the mine's history, says a statement released by W. H. H. Cranmer, president.

The net income was derived from ore sales totaling $661,639; premiums of $193,152 on excess production; and $50,627, miscellaneous income. Mine labor expense totaled $266,109 and mine supply cost was $94,720, with general expense of $136,373.

NEVADA

Natomas will dredge Greenan property — Tonopah Belmont starts mill construction

★United States Vanadium Corporation resumed operation early in August of its 200-ton scheelite concentrator at its Riley tungsten mine in the Potosi district, Humboldt County, closed down since July 18 when lightning damaged transformers between the plant and the Getchell mine, four miles distant. Capacity of the Riley plant is to be increased shortly to 500 tons per day. Concentrate is trucked some 400 miles from this plant and from U. S. Vanadium's Pine Creek concentrator near Bishop, Calif., to the lately-established chemical finishing plant employing units of the Basic Magnesium Inc. installation at Henderson, in Clark County.

★Negotiations are said to have been opened with the War Assets Administration by Northwest Magnesite, a State of Washington chemical concern, for acquisition of the Manganese Ore Co.'s 1,000-ton plant, operated during the war on low-grade manganese ore from the nearby Three Kids mine by the M. A. Hanna Co. The U. S. Bureau of Mines lately issued a bulletin describing the successful production of manganese metal from this ore in its electro-chemical test plant at Boulder City. Former nodulizing procedure is said to be too costly for a peacetime operation. First designed as a small pilot plant, the enlarged Boulder City plant in three years produced 1,022,786 lb. of electrolytic manganese from 2,445 tons of ore.

★Silver ore has been trucked lately to the McGill smelter of the Kennecott Copper Corporation from the old Richmond silver-lead mine near Berlin, northern Nye County, opened in the late nineties by J. Phelps Stokes of New York and still owned by his son and namesake. In charge is Dan Johnson of Tonopah, manager in earlier years of Stokes' productive Berlin silver-gold mine a few miles distant, where the Stokes manage-

ment is reported planning a long deep-level tunnel to explore the vein system below old workings and designed to drain a large area.

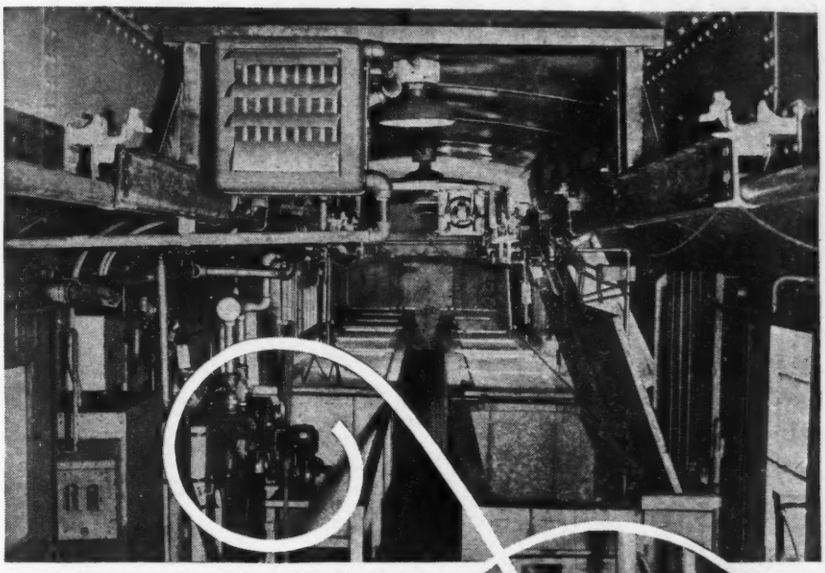
★Equipment for a 100-ton flotation mill, construction of which had started before L-208, is being assembled for early operation at the property of the Old English Gold Corporation in Troy Canyon, near the White Pine-Nye County line, a silver-gold district in which an English company, led to a new find by Indians, in 1869 built a 20-stamp mill and "furnaces." Joseph Hafen is president and manager, with office at Ely.

★Cooperating with the U. S. Geological Survey, the Nevada State Bureau of Mines, Jay A. Carpenter, director, has issued a bulletin, with detailed geologic maps, describing scheelite deposits in the Osgood range, eastern Humboldt County, and embracing the productive Potosi or Getchell district. The present reserve in a half-dozen developed mines is estimated at 800,000 tons containing over 500,000 units of WO_3.

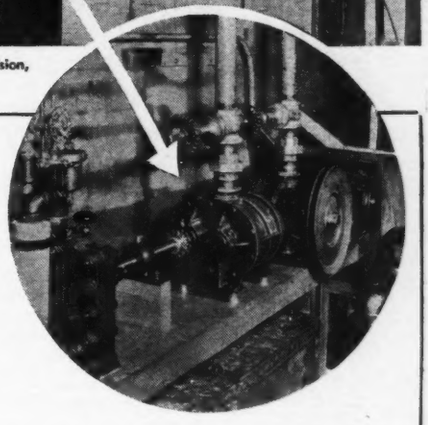
★Natomas Company of California, operating an 18,000-cu. yd. bucket-line dredge below Manhattan, Nye County, will complete the operation within the next few months and will proceed to dredge the Greenan placer property below Copper Canyon, Lander County. Test work conducted by J. O. Greenan, the owner, and by Natomas, is said to have proved 60,000,000 cu. yd. of paying gravel. A 4,000-yd. walking-type Monaghan dragline dredge is being prepared by Natomas to operate on shallower gravel in lower Copper Canyon, and a large bucket-line unit, possibly the one at Manhattan, will be provided for the deep gravel or broad alluvial fans in the flat area where gravel in places is 200 ft. in depth. John L. James is engineer in charge for Natomas at Manhattan.

★Excavation is in progress for construction at the Tonopah Belmont mine of a 150-ton flotation-cyanide plant, and stopes down to the 1,000-ft. level are being prepared for production under the direction of William J. Loring, head of the lately-organized Tonopah Belmont Consolidated Mines Co. Mill equipment has been acquired from a California plant, and mine timbers have been ordered from a northern lumber mill. Water will be pumped from the Halifax shaft, some 4,000 ft. from the millsite, to provide an adequate supply.

★Dayton Consolidated Mines Co. is preparing to resume operation of its 200-ton cyanide mill at Silver City, prior to the war Nevada's second largest producer of gold bullion, largely from custom ore trucked from a radius of 200 miles. Between 1938 and its closing down by Order L-208, the Dayton plant produced $2,438,030 from custom ore and $3,836,674 from its own mines, a total of $6,274,704 in bullion shipped to the mint. Homer



Photographs courtesy of Farwell Metal Fabricating Division, St. Paul, Minnesota.



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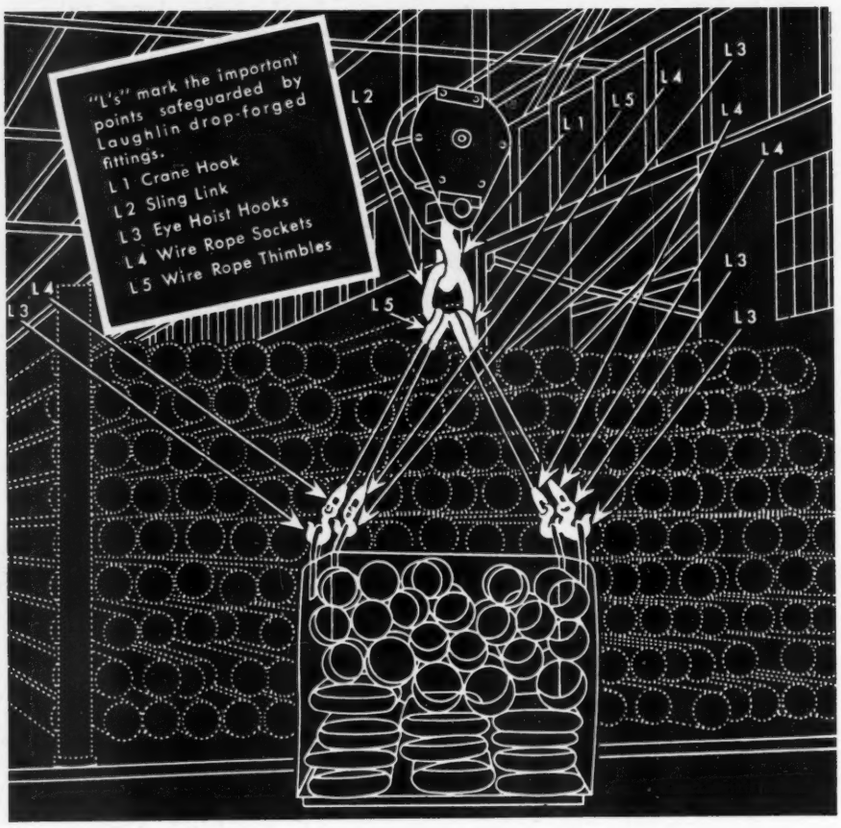

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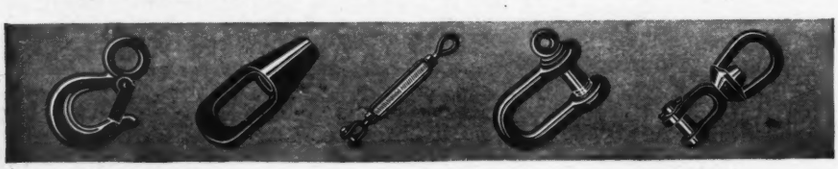


Nevada *(continued)*

L. Gibson, Virginia City, is president and W. J. Henley manager.

★A mine crew has been assembled with the purpose of reopening the Nivloc silver mine in Esmeralda County, operated before the war by Desert Silver Inc., headed by Ira B. Joralemon of San Francisco. Following the shut-down by WPB order, the 175-ton cyanide mill was dismantled and sold. During several years the Nivloc mine was the largest Nevada silver producer. A new organization has acquired the mine, with Harry Holmes as manager.

★Investigation of an old tunnel on claims owned by the Lucky Boy Mining Co. of Hawthorne, situated near Gabbs in Nye County, was said to have revealed a large body of high-grade silver ore. Urpo Kyto of Duluth, Minn., president of the Lucky Boy company, after inspecting the find, announced development work would be undertaken at once.

ARIZONA

Magma Copper plans financing of San Manuel—Phelps Dodge to expand production

★Stockholders of the Magma Copper Co. were to be asked at a meeting in Augusta, Me., Aug. 29, to finance one of the biggest mining projects in Arizona since pre-World War I days. The proposal contemplated increasing capital stock from 410,000 to 1,200,000 shares, the proceeds to be used in the development of the largest body of ore discovered in the State since 1910. The ore deposit, estimated at 100,000,000 tons, is located near Tiger in Pinal County, 46 miles northeast of Tucson. A 140-man crew has been making drill tests that give promise of a development unequaled since Phelps Dodge opened the Morenci mine.

Already there is the beginning of a town on the site that will be known as San Manuel. The Anaconda Copper Mining Co. has leased adjacent properties.

★Employment and production will be rapidly increased during the coming months at all Phelps Dodge Corporation copper mines and mills in Arizona, except Clarkdale and Jerome, according to an announcement by Harry M. Lavender, director of western operations, and vice-president and general manager of the corporation. The plants at Bisbee, Douglas and Morenci are not only getting up steam for full production, but planning expansion of activities which will give more employment and start additional flows of copper, lead, and zinc to the national market.

"Before the recent CIO strike we were man-power hungry," Lavender said, "but now many men are applying for jobs. For the first time since 1941 we have an ample supply of labor. This seems to us a decided trend. We actually have an excess of labor not expected, but with the expansion of operations we can use hundreds of these men."

The Douglas plant has two furnaces operating 24 hours a day and a third furnace will be in operation by fall. Seven hundred men will be used when the third furnace is completed.

"Bisbee will go much beyond what we expected in copper production," Lavender added.

At the time of the CIO strike, 917 men were on the payroll in Bisbee. Hiring will continue until the number reaches between 1,400 and 1,500. Morenci will have 2,500 men employed in the open-pit mine under the new program.

The return to large-scale copper operations from the mining of lead and zinc was explained by Lavender as resulting from the favorable labor market and the national demand for the metal.

★The Arizona Tax Commission has announced a valuation of $147,269,361 for the State's producing mines and plants, a reduction of $195,369 from 1945. The valuation of mines alone was $617,967 above last year, but plant values were reduced $813,363.

Valuation of mines and plants by counties is as follows:

Yavapai: Bagdad Copper Co., $1,049,706; Iron King, $409,950; United Verde, $3,139,592.

Cochise: Copper Queen, $9,650,502; Shattuck Denn, $800,770: Coronado Copper and Zinc Co., $99,080.

Gila: Christmas Copper Co., $82,000; Inspiration Consolidated Copper Co., $17,339,571; Miami Copper Co., $5,614,998; Arizona Chrystolite Asbestos Co., $33,900; Castle Dome Copper Co., $1,996,544; The 79 Lead Co., $12,200.

Greenlee: Phelps Dodge Corporation, $50,036,639.

Mohave: Tennessee Mine, $66,500.

Pima: Control Mines Co., $7,960; Eagle Picher Co., $493,500; New Cornelia, $31,133,080.

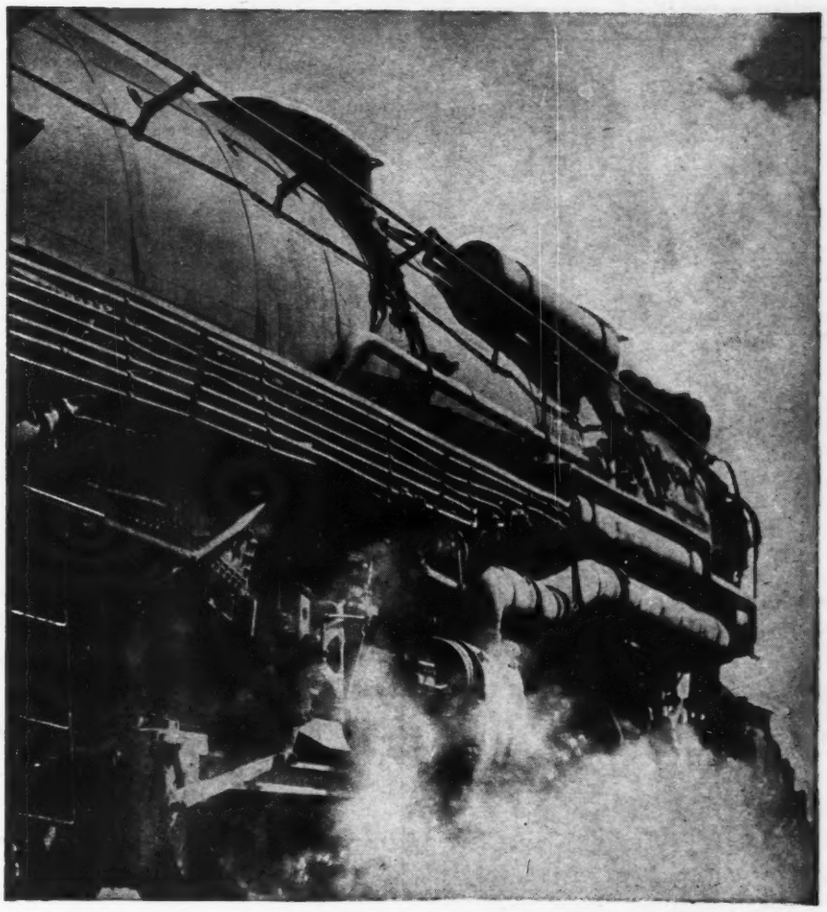
Pinal: Kennecott Copper Corporation, $9,902,646; Magma Copper Co., $4,701,803; St. Anthony Mine and Development Co., $482,975.

Santa Cruz: Trench Mine, $206,955.

★Hundreds of Arizona small copper, lead and zinc mines have been assured continued operation at least until June 30, 1947 by the action of President Truman in signing the OPA bill, with provision for continuation of the premium price plan and increases in premiums if circumstances require.

A bulletin to members of the Arizona Small Mine Operators Association advised that OPA is instructed to make adequate allowances for depreciation and depletion.

Charles F. Willis, secretary of the



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Arizona *(Continued)*

A.S.M.O.A., said that it was anticipated that during this one year period many of the small mines will have reached a stage of economical operation whereby they can continue to produce without premiums.

★With the announcement that the Phelps Dodge Corporation will cease operations at its Jerome and Clarkdale properties some time next year, the two towns are now looking for means of escaping the fate of becoming ghost towns. The area's ore deposits have yielded $600,000,000 worth of copper since being tapped in 1883.

★The cost of the recent mine strikes in Arizona, aside from the value of lost production, totaled over $4,250,000 direct loss in wages, taxes and purchase of Arizona products, according to a recent survey. The value of production lost during the four-month-long strike was estimated to be over $16,000,000. The survey showed that 365,200 man-days of work were lost with a loss of wages totaling $3,036,000.

Lost metal production amounted to 90 million lb. of copper, 20 million lb. of zinc, 45 million lb. of lead, 3,400 oz. of gold and 420,000 oz. of silver.

TRI-STATE

Three to five year extension of premium payments urged—Bilharz leases Treece ground

★Realization of the importance of the premium price plan under a free trade policy to sustain the marginal production of the Tri-State zinc-lead mining district was emphasized forcibly by the nearly complete general shutdown of the industry during July, when the fate of the premium program was so closely interwoven with that of OPA. Loss of the field's potential ore reserves of some 50 million tons and its effect upon the national economy was brought quickly to the attention of congressmen and administration leaders, with strong emphasis on conservation of these remaining ores, which was pointed out as one of the chief reasons for restoration of the premium system. Since the renewal of OPA, the industry—production of which in a three-week period had dwindled to less than one-tenth of its regular rate—has resumed operations under the old OPA ceilings and quota formulas with the conviction that the groundwork must be laid immediately for a three- to five-year continuation of premium payments, or even a more permanent period, if the domestic industry is to hold its productive capacity.

★In the field of labor relations during the month, threatened strikes called by members of the International Union of Mine, Mill & Smelter Workers (CIO) were averted with the signing of "standard" contracts with union representatives by company officials of the Cardin Mining & Milling Co., Big Chief Tailing Co. and Tri-State Zinc, Inc. The three companies operate a total of seven tailing re-treatment plants in the Picher field. All surface, including mill, employees of the Eagle Picher Mining & Smelting Co. were given the opportunity to ballot in a National Labor Relations Board election held August 15 at company properties in the Tri-State area to determine whether they desired to be represented for the purpose of collective bargaining by the same international union. Employees who were on the payroll for the week ending July 4 were eligible to vote. Results of the election were 232 for and 113 against the union.

★Tri-State Zinc, Inc., has moved its main offices from Picher to Galena, Ill., where the company is opening two zinc-lead mines and has built a new concentration plant in the Northern Illinois-Wisconsin mining district. Everett L. Bean, office manager, has moved his family from Joplin to Galena. Victor C. Allen, general superintendent of the company, moved with his family to Galena some time ago, and M. H. Loveman, manager, presently is at Galena. A branch office of the company has been established in the Engineers Building at Joplin.

★Eagle Picher Mining & Smelting Co. also has obtained leases on several hundred acres in the Illinois-Wisconsin field, and is reported to have made some good churn drill strikes recently.

★American Zinc, Lead & Smelting Co. has started the dismantling of its Hunter mill, at Aurora, preparatory to moving and rebuilding it on the old Winakah smelter site in the Ouray, Colo., mining district. Having mined out the known ore bodies on its Aurora leases, the company is abandoning these operations.

★Acquisition of the old Muncie and Early Bird leases by the Bilharz Mining Co. from the Federal Mining & Smelting Co. has been announced by O. W. Bilharz of Baxter Springs, president of the former company. The leases, situated a mile northwest of Treece, comprise a total of 210 acres, 170 acres of the Early Bird and 40 acres of the Muncie, Bilharz said. In addition to the leases acquired, Bilharz is renting mining equipment and machinery used by the Federal company on both properties. Preparations are being made by Bilharz to reopen the old Muncie mill shaft, utilizing the Federal derrick and hopper and other equipment already installed at that site. The shaft is being repaired preparatory to an early start of mining operations. With the resumption of mining, ore will be trucked to the Youngman mill, about three-quarters of a mile to the

southwest. Bilharz contemplates later reopening the old Federal, or No. 2, shaft on the Muncie, and plans to utilize the Federal derrick and hopper from the old Big Elk mine to pull dirt from the Early Bird at the No. 2 site. He also plans to utilize most of the mining equipment stored at the Bilwil mine on the old Ebenstein lease, which formerly was used by his company in operating the mines on the Brewster lease, northwest of Baxter Springs.

★Inadvertently, destruction of the Ritz mine mill, a half-mile southwest of Cardin, which was destroyed by fire last June 14, was not reported previously. The 300-ton mill, one of the oldest in the district, was owned by Kansas Explorations, Inc., and was built nearly 20 years ago when the Ritz mine was purchased by the company. Ross Blake, district manager, said the mill cost $300,000 when constructed in 1927. Apparently the company does not plan to rebuild, but will continue to mine the Ritz lease and treat the ore over a custom mill.

ARKANSAS

Initial shipment of ore made from Mine 16 — Maumee zinc mine scheduled to produce

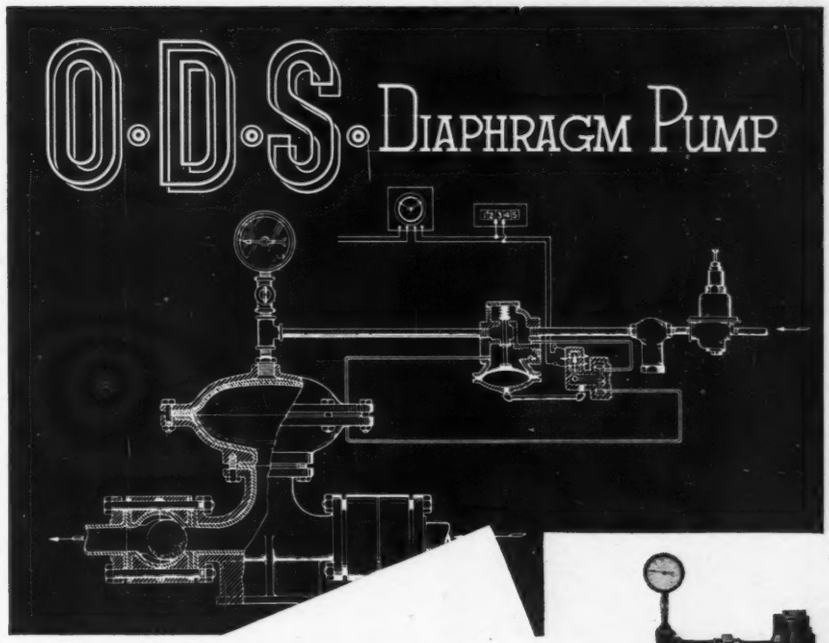
★Mine 16, located near Buffalo, in Marion County, shipped its first car of high grade zinc carbonate on July 3. This property is now known as the Strategic Mineral Production Co. Dr. L. E. Faris, of Kansas City, Mo., is the owner. Arlis Vickers is mine foreman, and Paul Turney, of Mountain Home, Ark., is in charge of operations. Lewis Flader is not now connected with the company.

★The Mattie May Mining Co., operating the Mattie May mine, near Rush, Marion County, has completed installation of underground equipment and is now working on a vein of high grade sulphide of zinc. Luther V. Nelson is president and general manager. Pat McCormick is foreman.

★Definite information is lacking as to whether or not Metals Reserve will open its buying depot at Batesville, now that the stockpile bill has been signed. This is still holding back production in the Batesville-Cushman manganese field.

★Chas. Sims, of Cushman, has purchased the Hawkins property, on which he held a lease for several years. He has opened up one vein of high grade manganese, which is nine feet thick. His production in July totaled 50 tons of high grade ore.

★Figures released by Harold Foxhall, head of the Geology Division of the Arkansas Research, Resources and Development Commission, show that the State's 1945 production of minerals, including petroleum and allied prod-



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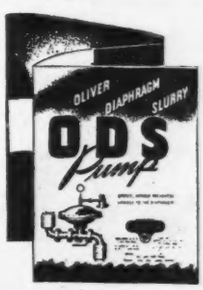

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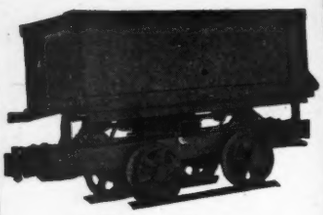

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Arkansas (*Continued*)

ucts, coal, clay, gravel, limestone and sands, had a total value of $51,431,536. Barite production was valued at $1,793,248; bauxite, $5,002,098; manganese, $134,307; zinc ore, $1,104.

★It is reported that the Maumee mine, at the Buffalo River ford in the Maumee County zinc field, is ready to begin production under direction of the owner, Ed Zimmerman. Tom Matlock is mine foreman. Shafts extend to 90 ft. of depth, and several veins have been opened.

ILLINOIS and KENTUCKY

Pennsylvania Salt purchases Kentucky Babb mine—Leases taken by American Zinc & Lead

★Purchase of the Kentucky Babb fluorspar mine by the Pennsylvania Salt Co. from Roberts and Frazer, Marion operators of the Kentucky Fluorspar Co., has been consummated. Only the mine and stocked ore were included in the transfer; the Kentucky Fluorspar Co. continues operation of its mill at Marion.

The new owners have closed the mine, and there is no immediate plan for operation, according to Terrance A. Woodsmith, Pennsylvania Salt Co. geologist, who is making geological examinations.

Core drill prospecting also is being done by the Pennsylvania Salt Co. in the section of Livingston County, Ky., east and south of Carrsville.

★An assignment of property leases and options, embracing approximately 8,000 acres in Crittenden County, Ky., to the Reynolds Metals Co., of Richmond, Va., has been filed in the office of the County Court clerk at Marion, Ky. The leases were assigned to the company by Charles L. Cassady, of Marion. The property is located in the section of the county near the Ohio river border and is largely undeveloped.

★Leases on three Kentucky fluorspar properties have been acquired recently by the American Zinc & Lead Smelting Co., of St. Louis. These include property known as the "9-Acre Tract"; the old Columbia mine, which originally was explored by a mining company headed by President Andrew Jackson; and the Fritz tract, owned by Boyce Moody, of Salem, Ky.

★Effective Aug. 1, all hourly-rated employees of the Aluminum Ore Co., subsidiary of the Aluminum Co. of America, were granted a 9c. hourly wage increase, according to announcement by Walter S. Skeels, works manager of the company's plant at Rosiclare, Ill. The increase was made, Mr. Skeels said, in an effort to equalize the take-home pay of Aluminum Ore employees, operating on a 40-hr. week basis, with that of other companies in the Illinois fluorspar district, operating on a 48-hr. week basis, which recently gave a 10c. hourly raise.

★The fluorspar gravity mill of the Inland Steel Co., at Rosiclare, Ill., resumed operations Sept. 3 after being shut down since Jan. 1.

MICHIGAN

Calumet & Hecla opens Gratiot shaft — Second unit of Lake Chemical Co. producing COCS

★Calumet & Hecla Consolidated is opening another shaft, Seneca No. 2, better known as the Gratiot, on the Kearsarge lode. This shaft and Seneca No. 1, which is in production, were formerly owned by the Seneca Copper Co. The surface plant at No. 2 is being repaired and renovated. A temporary engine house has been erected to house a small electric Nordberg hoist which has been in use at the Centennial mine. This unit will be used while shaft repairing is under way and until a permanent engine house is built. The small hoist will operate a two and one-half ton skip, and will be placed in operation as soon as electric service to the property is available.

The permanent engine house will be erected soon, using most of the material from the old No. 13 engine house at Calumet. The Nordberg hoist now located at No. 13 will be moved to the new location. The old compressor house at Gratiot will be dismantled and the material used to build a dry-house.

The old railroad right-of-way from Seneca No. 1, connecting with Gratiot, is being made ready for use.

★After many months of construction, the second unit of Calumet & Hecla's Lake Chemical Co. went into production on July 15, making copper oxychloride (COCS) in commercial quantities. The unit consists of six lead-lined reaction tanks, each 7 ft. in diameter by 12 ft. high, in which scrap copper is reacted with chlorides and sulphates to form COCS. Approximately 16 hours are required to make the conversion, following which the blue slurry is pumped into one of two 18,000 gal. tanks. After blending and conditioning in the tanks, the slurry is dewatered on a large continuous Oliver filter, where the greater part of the liquid is separated from the blue solid. The wet cake is loaded on trays and dried in large truck-tray driers until the material is commercially free of water. The truck and tray driers will eventually be replaced with a large Proctor and Schwartz continuous aeroform drier. Delivery of this unit will not be made before the end of the year. The dried

product is treated in a micro-pulverizer to break up the lumps and is discharged into a storage bin.

The so-called "fixed coppers" sprays and dusts, of which COCS is one type, are essential ingredients in many of the commonly used sprays and dusts for the control of a myriad of fungicidal growths on fruits, vegetables, and flowering plants. The "fixed coppers" may be effectively used in combination with the well known insecticides—lead arsenate, calcium arsenate, rotenone, nicotine, sulphur, and DDT.

★Calumet & Hecla and Isle Royale are again receiving a premium price for their copper, or a total of 22c. per lb. The premium price was restored by Congress in the new OPA legislation, and will continue for one year. No copper was sold by the companies during the month of July.

★Calumet & Hecla Consolidated Copper Co. was 80 years old in July. The anniversary passed quietly, but not without some consideration of the founders and early pioneers who worked together in the development of the mine, which became the greatest copper property in the world.

★The campus guide project which the Michigan College of Mining and Technology at Houghton established in mid-June has proved of use to more than 1,500 visitors to the campus and to nearly 400 new students who were taken on a tour of all buildings by the ten guides at the opening of the summer term. Visitors who have similarly inspected the campus include passengers of the S. S. South American, Great Lakes liner, delegates to various conventions, high school classes, and other groups. Among these men and women have been a number of industrialists and business men, some seeking prospective employees. The guides, nearly all ex-service men, wear khaki uniform and an identifying badge, and distribute maps and a campus guide booklet. Points of greatest interest have been the A. E. Seaman mineralogical museum, the mine model laboratory, and chemical engineering laboratories.

IRON COUNTRY

Jones & Laughlin to construct research laboratory — Cary mine equips for ore storage

★As a preliminary to opening up several mines on the Marquette range, the Jones & Laughlin Ore Co. and Interstate Iron Co., both subsidiaries of the Jones and Laughlin Steel Corporation, will erect a three-story research laboratory on their property in the southeast section of Negaunee, Michigan. The building contract, totaling close to $200,000, has been let to McDonald & Kaake, and construction will start immediately. The

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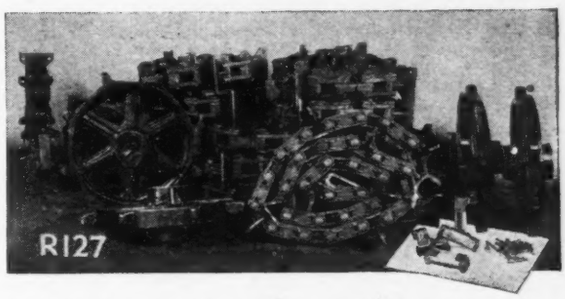
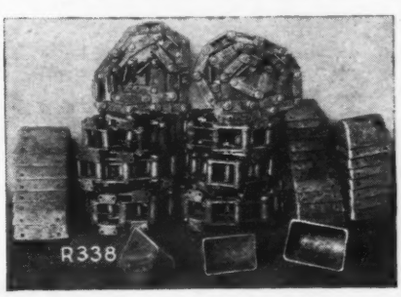


R-127. Amsco pinlock (patented) drag chain for a tough job of sand handling. A chain of this type lasted over nine times as long as the heat-treated steel chain which it replaced.

Elevator buckets, also, are subjected to severe abrasive action and shock stresses. Amsco Manganese Steel Buckets have effected substantial economies in abusive mining applications. These buckets can be supplied in standard sizes, plain or with cored holes.

Send for descriptive Bulletins 742-CN and 842-WS.

Joliette Steel Limited, Joliette, Quebec, owned by American Brake Shoe Company, produces and sells Amsco Manganese Steel Castings in Canada.



R-338. Amsco No. 111 and No. 132 standard combination chain with elevator buckets for a mill processing dolomite stone for magnesium production.

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Iron Country *(continued)*

building will house not only a complete pilot mill, but all the machinery and chemical equipment needed for treatment of low-grade iron ores. This plant is near the Blue, Prince of Wales and Queen group of mines which were closed down about 1900 after the orebodies near the surface were exhausted. A large force of geologists and mineralogists has been at work for several years, putting down drill holes and checking the orebodies under the direction of L. J. Barrett, vice-president, of Pittsburgh, and H. S. Petersen, Michigan superintendent.

★At the Cary mine of the Pickands Mather Co., Hurley, Wis., structural steel for the conveyor gallery and railroad pocket near the storage pile is being erected by Wisconsin Bridge and Iron Co. The conveyor belt is 30 in. wide and carries ore and rock from the screen and crusher located in the shaft headframe to a receiving pocket located over the tracks which not only loads the railroad cars but also handles the stockpile cars in the wintertime. With this equipment completed, the mine will be ready for ore storage next winter.

★Minnesota will lead the U. S. in iron powder output. When the Continental Machines, Inc., Minneapolis, Minn., starts operation of the $1,000,000 State pilot plant on the iron range to produce iron powder in February, 1947, Minnesota will produce more than twice as much as any other state. Iron powder plants in Indiana produce a maximum of two tons per day. The new Minnesota plant is now being erected five miles north of Aurora, Minn. Iron powder has been used succesfully by both Chrysler and General Motors, but neither has had enough for its needs. The Chrysler car contains 61 different parts made from the powder. Although iron powder hitherto has been made from waste iron tailings, the new plant will manufacture the powder from carbonate slate, formerly a waste product.

ALASKA

Secretary of Interior makes tour of Territory—Medfra and Circle districts active

★Mining men hope for important results from the 13-day tour which Secretary of the Interior J. A. Krug was scheduled to make through the Territory starting August 11. Delegate Bartlett stated that Secretary Krug had evinced great interest in getting all possible knowledge about the Territory, and a number of staff meetings were held in Washington during the summer. The secretary has brought forth a seven-point program to develop Alaska's "vast economic potentialities" and attract new settlers. He desires to settle quickly several issues which have impeded territorial development.

★Prospecting by drill of placer ground, near Medfra, has been resumed this year by Walter Culver and Leslie Nappe, of Anchorage. Charles Mespelt and associates are also inspecting their ground in this area, and a lode-gold property near Medfra has been leased by R. H. Storch, who expected to send mining equipment in from McGrath. Ramstad brothers will resume operations on Kako Creek which joins the Yukon River, near Russian Mission.

★A number of small operations are in progress in the Circle district. The Berry dredge with 14 men is under Harold Christensen's management. Johnny Frasco and Chuck Gibson are making the first cleanup of the year on Eagle Creek. Harold Myers is employing two men on Half Dollar Creek doing stripping work. Tony Zimmerman has three men working on Independence Creek.

★Dr. William Embry Wrather, Director of the Geological Survey, and Dr John C. Reed, Chief of the Alaska Division, took a three weeks trip through Alaska this summer. According to Dr. Wrather, the Survey has six men with parties working in southeast Alaska. These are: Matt Walton at Blashke Is., near Wrangell; W. T. Tivenhofel in the Juneau gold belt; Darwin Rossman on Chichagof Is.; Coldar Bressler at the mouth of Stikine River, studying garnets; George Flint at Gypsum, on Chichagof Is., studying limestone formations; and Irving Gessley on Prince of Wales Is.

★According to Robert S. Sanford, Division Engineer for the U. S. Bureau of Mines, who recently returned to Alaska from conferences at headquarters in Washington, D. C., the investigation of Kobuk River asbestos deposits with their adjacent jade is to be continued into 1947 and perhaps 1948. He reported that mercury projects in the Kuskokwin River area, on Holitna River and Rainy Creek, 75 miles south of Bethel, will have work started on them this year. Sanford is hopeful over the possibilities for mercury in western Alaska. The Red Devil mine, near Sleitmut, and DeCourcey Mountain mine, halfway between Flat and Crooked Creeks, are proving profitable.

★Arctic Circle Exploration Co. is operating at near capacity in the Candle Creek area. One dredge is operating and another is expected to start operations soon. Thawing of both fields is in progress.

★The St. Paul mill, at Eva Creek, near Ester, will be repaired and reopened by the Alaska Mining Co. Inc., according to A. J. Stern, president. Until the company's own ore is ready for milling, customs milling will be done.

CANADA

Gold mines little benefited by Ottawa relief measures — Silver boom develops in B. C.

★"No significant amount of Canadian gold could be legally sold abroad at premium prices unless payment was taken in an inconvertible local currency, which would be of no use to the Canadian seller," it was reported by Hon. D. C. Abbott, acting Minister of Finance. He added: "A premium market for gold could not be expected for any sizeable quantity or for any considerable length of time." The Finance Department is to continue control of all foreign exchange transactions for several years. On July 26 Ottawa announced relief measures for the gold mining industry designed to partially offset the effects of the ten percent reduction in the Canadian price of bullion. These provisions constitute tax changes and a reduction in mint handling charges for bullion. A former privilege to new mines was restored, granting freedom from all taxes for a three-year period. The former 50 percent depletion allowance was not restored although Ottawa did grant a temporary two-year depletion allowance of $2 per oz. of gold produced. It is estimated that no relief will result from this allowance to the average mine. As examples, East Malartic would save nothing and Canadian Malartic would save only $800, on the basis of 1945 operations. The relief plan announced by Ottawa will assist 12 Ontario mines but will not affect the other 26 producing gold mines of the province, as reported by the Ontario Mining Association. Pamour, Paymaster, Young Davidson, and Matachewan Consolidated will benefit only to the extent of 1c. per ton. Maximum relief of 19c. a ton in net profits is estimated for Toburn.

★The gold price decline on July 5 to parity with the U. S. dollar is expected by many in Canada to be followed by a move to higher levels in the indefinite future. Whatever aspects of the problem may be developed, the present results of revaluation have been drastic. First came a market decline amounting to about $500,000,000 in listed stocks. Settlements in Canada's north country have been dangerously threatened by possible mine shutdowns and imperilled jobs. Widespread cancellation of diamond drilling projects has developed as a direct consequence of the action at Ottawa. Exploration and mine development have been seriously threatened.

★While major opposition to lowering the price of gold has come from the management of producing mines, critical effects of the policy at Ottawa also have been felt by the large number of properties in the early stages

of exploration. Many of these lack finances adequate to continue work under the prevailing high costs and adverse future outlook. In Ontario, 85 percent of gold production has come from mines discovered before World War I; 5.4 percent from those discovered in the period 1926-1930; and 5.6 percent from mines discovered 1931-1935, as reported by the Ontario Mining Association.

★Supply shortages continue to threaten Canadian mines with curtailed operations, although the labor situation is steadily improving. The steel strike has become a serious problem in securing adequate volume of mill liners, balls, rails, and plate. Shaft sinking has been delayed at several mines and the start of some contracts has been stalled by shortages of dimension timber.

★Labrador Mining and Exploration Co. reports completing several drill holes to depths of 200 ft. on bodies of iron ore that have previously been reported on surface. It is proposed to continue the diamond drilling after freeze-up this year. The iron deposits are known to have surface lengths of one mile or more and widths of 900 to 1,500 ft. Information on depth is required before undertaking plans for railroad construction and other heavy investments required for exploiting this area which is now accessible only by air.

★Dome Mines, Frobisher Exploration, and Norancon Exploration, Ltd., are also active this season in Labrador and the adjoining areas of Quebec. Norancon has been formed by Noranda, Anglo-Huronian, and Conwest to explore two large areas in Labrador and a concession of 1,500 square miles in Quebec. Three planes based at Goose Bay are servicing three crews totalling 34 men. Frobisher has been doing aerial exploration, and Dome has more than 25 men working on its concession.

QUEBEC

★Production is scheduled to start in Jan., 1947, at the property of Louvicourt Goldfield Corporation. The main shaft was reported early in August down to 410 ft., and the second level had been established at 375 ft. The four-compartment shaft is to reach to 800 ft. The ore zone has been explored by diamond drilling for a length of 2,000 ft. Foundations for the mill were complete and erection work in progress. Machinery and other materials were on hand for the plant. An initial rate for the mill is to be 600 tons a day. Pierre Beauchemin is president and George H. Dumont mine manager.

★Aubelle Mines, adjoining Belleterre on the west, has completed 1,000 ft. of work on the 250-ft. level, where a shoot of $6 ore has been indicated for a length of 155 ft. On the 500 level a similar grade has been traced for a 215-ft. length. Drifting on the

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Canada (*Continued*)

375 level has not advanced far enough to determine the length or average grade. No lateral work has been attempted on the first level, which is at 125 ft.

★D'Aragon Mines, adjoining East Sullivan on the south, has reported copper indications in two recent drill holes. No. 11 hole showed 2.33 percent copper across 5 ft. and 2.3 percent across 3 ft. No. 13 hole returned a 5-ft. core length grading 2.1 percent and 0.88 percent across 15.0 ft. One of the copper areas extends from surface to a depth of 400 ft. and the other is located below 900 ft. A vertical hole has been started with the objective of cutting through both zones to a 1500-ft. dpth. Paul D'Aragon is president.

★Lapaska Mines, located east of Louvicourt Goldfield Corporation, has traced a series of flat-lying veins for a 700-ft. length in the course of extensive diamond drilling. These veins comprise a zone of quartz-tourmaline stringers averaging about 90 ft. in width. Due to the flat dip it is proposed to gain detailed information through underground exploration, and plans are now being considered for shaft sinking. Promising values secured from recent vertical holes include the following: Hole 62, $52.85 across 0.5 ft.; Hole 61, $13.90 across 10.7 ft.; Hole 60, $9.80 across 3.3 ft.; Hole 59, $24,50 across 2.1 ft.; Hole 58, $8.05 across 3.3 ft.; Hole 57, $10.15 across 1.5 ft.; Hole 56, $27.02 across 6.3 ft. Denison Denny is president of Lapaska, which is controlled by Lapa Cadillac Gold Mines.

MANITOBA

★For the first six months of the current year Hudson Bay Mining and Smelting Co., Ltd., reports net earnings, after allowance for taxes and expenses, of $3,898,606 or $1.41 per share. During the period 915,424 tons of ore were milled. Earnings for the first half of 1946 are higher than any similar period with the exception of the first half of 1943 when the company realized $1.46 per share. The adverse effect of the return to parity of the Canadian and United States dollar on earnings for the balance of the year will likely be offset by increased prices for export copper and zinc and by higher silver prices.

★Wekusko Consolidated Limited has completed the sinking of a 500-ft. shaft on the Ferro property located on the east side of Herb Lake.

★Exploration at the Lynn Lake copper-nickel property of Sherritt Gordon Mines, Ltd., is now being concentrated on the downward extension of holes which either had encountered sulphides in the upper zone and were ended at shallow depths before the present visualization of the structure was considered, or terminated in copper-nickel sulphides at the maximum depth possible with the drills in use. Recent drill results include the following: Hole No. 7, located 100 ft. north of Hole No. 48, from 458 ft. to 540 ft. averaged 0.67 percent nickel and 0.41 percent copper; Hole No. 73, 100 ft. south of Hole No. 55, from 493 ft. to 806 ft. averaged 1.06 percent nickel and 0.31 percent copper; Hole No. 76, 100 ft. west of Hole No. 48, from 404 ft. to 470 ft. averaged 1.40 percent nickel and 0.66 percent copper; Hole No. 40, 100 ft. east of Hole No. 34, from 845 ft. to 1,145 ft. averaged 1.55 percent nickel and 0.80 percent copper.

In the "E" orebody two interesting intersections have been obtained. Hole No. 78, 150 ft. west of Hole No. 63, from 180 ft. to 199 ft. averaged 2.18 percent nickel and 0.17 percent copper. Hole No. 82, 50 ft. west of Hole No. 78, from 247.3 ft. to 278 ft. averaged 3.75 percent nickel and 0.68 percent copper.

The camp buildings at Lynn Lake were prefabricated at Sherridon and hauled by tractor some 150 miles to the property. The interesting innovation was necessitated by the lack of suitable timber in this northern area. Summer freighting is being handled by "Canso" flying boats. As many as five trips per day are completed with a payload of from four to five tons being carried each trip.

BRITISH COLUMBIA

★The strike of hardrock miners which commenced July 3 is continuing with few indications of settlement. The issues in dispute have been further complicated by expressions of definite opposition to wage increases exceeding 10c. an hour by representatives of the Federal Government. Mine operators, who withdrew their original offers of 6½c. an hour, following the Government's decision to restore dollar parity with the United States, are reluctant to grant wage increases without a more adequate measure of taxation relief than has been offered to date. Loss of $3.50 an ounce resulting from the parity move is not likely to close any producing mines in this province, but will be reflected in greatly reduced operating profit and ore reserve positions.

★A new silver boom which shows signs of equalling, if not surpassing, the feverish development of high-grade silver-lead-zinc deposits witnessed in the Slocan district in the 'nineties' is rapidly gaining momentum. Names of famous old silver mines are appearing in the news again, including the Silversmith, Ruth Hope, Carnation, Queen Bess and Cork Province, all renowned for extremely rich deposits.

Prominent among the larger operators actively interested in Slocan silver properties are Quebec Gold Mining Corporation, Kelowna Exploration Co., Ltd., and Granby Consolidated Mining, Smelting and Power Co. Numerous other companies are active.

★Hampered by inability to secure sufficient manpower for full scale operation, Western Exploration Co. is concentrating on a comprehensive development program designed to open orebodies previously determined by diamond drilling. The mill at the company's property near Silverton was operated for ten days in June. Production was valued at approximately $22,000, with ore grading from $18 to $20 a ton. No attempt will be made to resume milling until conclusion of the current strike.

★Hedley Mascot Gold Mines, Ltd., reports production for 1945 aggregated 17,181 oz. gold valued at $717,395 from 56,503 tons milled averaging 0.31 oz. gold per ton. Operating costs were $673,369, and after provision for depreciation and taxes, net loss was $19,286. During the year the 3,700-level was advanced 1,982 ft. into the Nick of Time ore zone. Work was commenced on the 2,700-incline designed to extend a distance of 2,600 ft. from an elevation of 2,700 ft. at a point 1,800 ft. back of the mill to the 3,700-level. It is planned to install a new surface and underground tramway from the top of the incline to carry ore direct to the mill. Development work done during the year included 2,308 ft. of drifting and crosscutting, 629 ft. of raising, 19,029 ft. of diamond drilling and 690 ft. of development on the 2,700-incline. Cost of development was $173,535, equal to $3.07 per ton of ore milled. The unusually heavy cost of development has been attributed to unavoidable postponement of this work during the war years. Dr. Victor Dolmage, consulting geologist, reported on development of the Hedley Mascot company's Good Hope property as follows: "The Good Hope property acquired and partly tested in 1944 was further opened up in 1945. During the year, 1,764 tons of ore were mined and shipped to the Hedley Mascot mill. This ore averaged 0.64 oz. gold per ton. The orebody is a replacement in a bed of limestone. The limestone lies on a bed of volcanic tuff and the ore occurs in the limestone immediately above the tuff contact. The beds dip to the northeast at a very small angle in consequence of which the ore outcrops over a considerable area. It has been stripped and sampled over an area of 10,000 sq. ft. from which the above-mentioned ore was mined. In this area the thickness varies from 5 to 15 ft., averaging between 6 and 10 ft. The grade of this ore, as indicated from the returns of the above-mentioned shipments, is better than half an ounce of gold per ton. The limited amount of exploration so far done on this property indicates important possibilities."

★Serious consideration of mill construction is now warranted, following favorable underground development at the Hedley Monarch gold-silver property in the Osoyoos mining division, according to T. C. Botterill, managing

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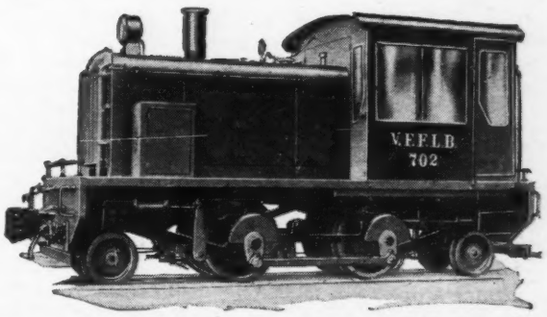

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Canada *(continued)*

director. During the past year a comprehensive program of surface exploration, diamond drilling and drifting has been carried out. This work has produced evidence to substantiate the belief that the Shepherd and Sweetener veins unite at depth. Other results obtained to date include the following: A crosscut driven from a point 30 ft. above the main highway has cut 13 ft. of ore, of which 8 ft. returned assays of 1.18 oz. gold per ton, and an assay across 5 ft. showed 0.8 oz., for an average of approximately $30.00 a ton across the full width. Drill hole No. 3 has intersected the same vein at a depth of 150 ft. at a point 120 ft. west and 40 ft. below the crosscut. This drill intersection across a width of 7 ft. showed values of $17.08 per ton in gold and silver. Diamond-drill hole No. 2 has cut 5 ft. of ore assaying $13.24 per ton at a vertical depth of 190 ft. on the Sunrise vein, 130 ft. north of, and parallel to, the Shepherd vein. A series of drill holes from the No. 2 level on the Something Good vein have confirmed favorable results obtained in development work done by previous operators. Hedley Monarch's immediate program calls for drifting, raising, and sinking on the Shepherd vein.

★First steps toward resumption of operations at the Duthie mine near Smithers, B. C., have been completed with plant, buildings and equipment now being reconditioned and a contract let to Boyles Bros., Ltd., for 5,000 ft. of diamond drilling. The property, formerly an important silver-lead shipper, equipped with a 70-ton mill, is now controlled by Duthie Mines (1946) Ltd., with Lt.-Col. C. B. North in charge as resident engineer.

★Net smelter returns from June production of $43,116 were received by Silbak Premier Mines, Ltd. Estimated operating loss was $9,014. During the month 5,436 tons of ore were treated, averaging 0.22 oz. gold and 1.57 ozs. silver per ton.

YUKON

★Yukon Consolidated Gold Corporation reports July production valued at $182,000 as compared with $153,000 for June. Dredge No. 7 commenced digging on Quartz Creek July 2 and Dredge No. 11 is now operating on Hunker Creek in virgin ground. Four other dredges are now operating, all in proved gravel. These are No. 3, on lower Klondike River; No. 4, on Bonanza Creek; No. 8, on Middle Sulphur Creek; and No. 10, on Middle Dominion Creek. It is hoped that it will be possible to recondition dredge No. 6 and to repair ditches on Lower Sulphur Creek in time to have this dredge in operation before the end of the year.

★According to Wm. A. O'Neill, Yukon manager for Clear Creek Placers, Ltd., and Yukon Gold Placers Ltd., McRae operations are progressing satisfactorily with 20 men doing dredging work at Clear Creek, 18 doing construction work on Thistle Creek, a small crew drilling and prospecting at Rosebutte, on the Yukon, and others working on Henderson Creek, where another dredge will be constructed.

★The King Solomon area has been the site of staking of more than 25 quartz claims, and recently staking has taken place at the head of Hunker Creek. At some of these properties it is reported that visible gold has been uncovered. Grant Henderson is doing bulk sampling from the King Solomon district at his stamp mill and testing plant in Dawson. Silver-lead ore is reported 25 miles below Dawson on the Yukon, where claims have been staked, and silver-lead has also been found on Little Twelvemile River.

★Ymir Yankee Girl Mining Co. is testing ground on Canadian Creek, Ballarat, Black Hills, and Kirkman, and up the Yukon for dredging or dragline possibilities. C. D. N. Taylor, of Vancouver, is in charge.

★Yukon Northwest Explorations, Ltd., headed by K. J. Springer, of Toronto, has been working in the Nansen Creek district north of Whitehorse. Represented by Dr. W. V. Smitheringale, the company took up ten claims on Victoria Creek, a tributary of Nansen Creek, where it has been reported recently that trenching operations exposed a vein from which samples assayed $65 to $200 in gold across 2 ft. in one section. Diamond drilling was done on the property during the past winter.

★Silver mining in the Mayo area will be resumed at the Hector and Calumet mines, on Galena Hill, this fall, according to announcement by Frank Buckle, general manager for Keno Hill Mining Co. Ltd., a subsidiary of Ventures Ltd., and Conwest Mining Co. Thirty men will be employed in reprocessing the Elma mill and getting equipment into shape for full scale operations.

MEXICO

President splits silver benefit three ways—Natividad reports—Rail workers ask wage rise

★Despite misgivings expressed by some economists over the benefits of a silver price rise, the consensus of labor, management, and Government seems to be that the recent price increase will help Mexican mining. For one thing, President Avila Camacho relieved a tense situation by ruling that the 21c. increase (to 90⅛c. U. S.) be shared equally by labor, management, and government. Most employers had taken the view that any such

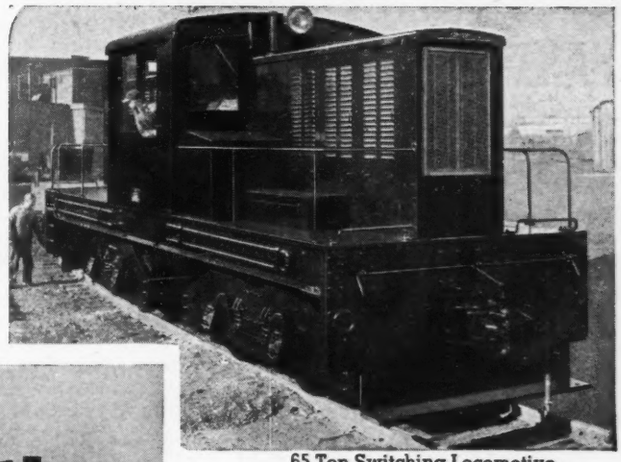
increase would be largely appropriated by Government and labor, and the allotment of one-third to the companies comes as a pleasant surprise to most. Augustin Guzman, secretary-general of the 33 silver sections of the national miners' union, announced that the union has agreed to abide by the President's ruling. Although peace seems to be the prospect for silver-mining companies for the present, non-silver miners still expect trouble, in that their workers have not shared in the increased revenues of the silver producers.

★The bright prospect for silver mining is somewhat dimmed by the demand of the railroad workers' union for an increase in freight rates, with special emphasis on silver-mine products. The workers claim that higher silver prices should permit higher freight rates on that industry and, in turn, higher wages to railroad workers.

★Production has increased at the Santa Fe cooperative, Guanajuato City. The group is mining low-grade ore, averaging two to three grams of gold and 150 grams of silver per ton, and was so deeply in the red that its future was threatened. In response to a plea from the reorganized administration for increased production, weekly output has risen from three to seven bars of silver.

★Cia. Minera de Natividad y Anexas reports that gold content of its ore ran higher last year than formerly, but that a lower silver content, coupled with decreased output caused by labor shortage and low productivity per man, served to hold income down. Work was confined to mining the San Ignacio vein, where 27,014 tons was mined with an average content of 31 grams of gold and 407 grams of silver per ton. Several tons of rich ore were taken from a small vein found just below the San Ignacio. Plans to improve the system of mining will be put into effect as soon as men are available. In the mill, treating the aforementioned tonnage, 960,273 kg. of flotation concentrate was made, assaying 843 grams of gold and 9,990 grams of silver per ton. Recovery was 94.3 percent of the gold and 80.5 percent of the silver, giving an average of 81.6 percent.

The company's hospital had its busiest year, treating 14,644 patients, or over 40 per day. Cost of hospital service, aid to three schools, housing, disability payments, paid vacations, and other social services, came to 245,236 pesos for the year. The strike of silver miners, which lasted 45 days elsewhere in Mexico, was averted at Natividad by an agreement concluded on the eve of the general strike. A 12 percent wage increase was granted at that time, and the mine's no-strike record is thus still unbroken. The report points out that rising wage and material costs, added to high taxes (1,573,027.71 pesos in 1945), are forcing Natividad to mine only the higher-grade ore, leaving in the ground the



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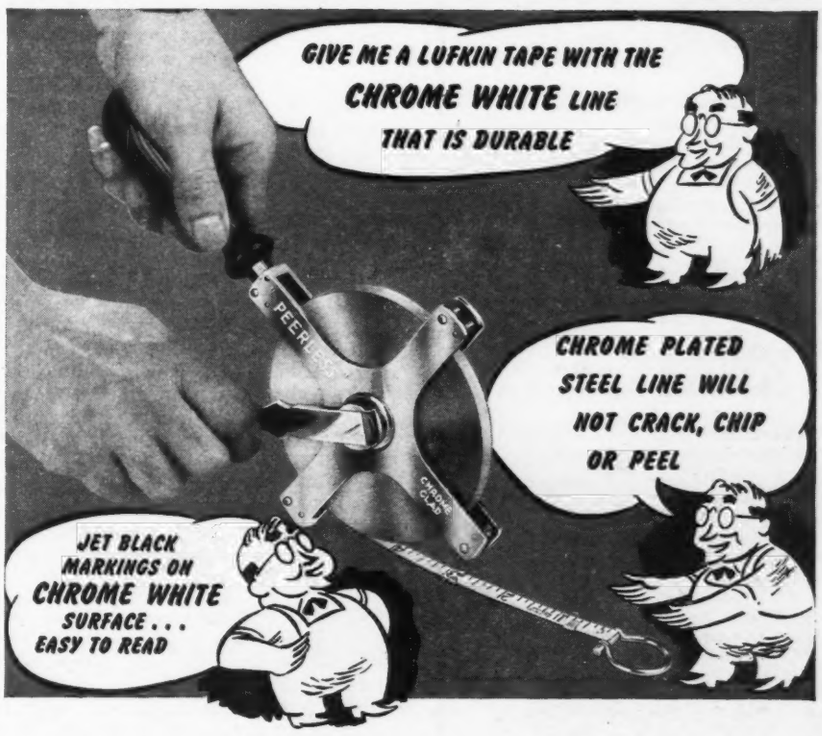
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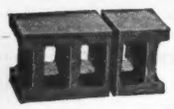

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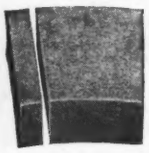

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Mexico *(continued)*

low-grade ore that might otherwise be recovered.

VENEZUELA

Diamond mining increases—Oliver Iron seeks ore—Nickel ores are tested—Gold output off

★Diamond prices have risen considerably since the end of 1945, and by July theye were at levels such that local buyers lost interest, inasmuch as New York prices were then lower than Venezuelan. However, inquiries were received from European buyers, and it is reported that increasing quantities of gemstones are going to Europe.

★Production is increasing from the field opened last year on the Rio Guari, a tributary of the Rio Kukenan, and a few daily recoveries as high as Bs. 5,000 to Bs. 7,000 ($1,500 to $2,100) have been reported by groups of four or five men working as partners. The Cia. Anonima Minera y Comercial (CAMYC) has interested Lehman Brothers, of New York, in its diamond concessions in the Gran Sabana, and following a visit by Phillip D. Wilson, representing the New York firm, it was decided to invest up to $1,000,000 in development of the CAMYC concessions. Late in June, R. W. Michael, an engineer with long experience in the lower Caroni diamond region, arrived in Caracas with three assistants, bent on exploration and development in the Rio Surukun field. These developments have caused renewed interest in both upper and lower Caroni River areas, and several applications for concessions have been made.

★Gold production in El Callao continues to decline, but if the power plant of New Goldfields of Venezuela can be rehabilitated within the next three months, there is a chance for increased gold output by the end of 1946. Maxwell Norman, general manager of the company, went to London during May to report and to discuss plans. Outlook for the company is not good unless new ore can be found in the next two or three years. Only one mine, La Laguna, is now producing ore.

★The price of gold in Venezuela rose early in the year to about $2.50 above the official level, because of shortage locally of the metal. However, the price was recently brought back to normal by action of the London Exchange Control Board in permitting New Goldfields of Venezuela to sell some of its gold output locally.

★Sampling of nickel deposits near Tinaquillo by engineers of International Nickel Co. has been completed. Future of the region now depends on results obtained by research metallurgists in treating the ore in a pilot plant. Because the ore is of low grade, low treatment costs are important. A decision on the development may be reached by the end of the year.

★Iron Mines Co. of Venezuela, Ltd., Bethlehem Steel subsidiary, has selected a new harbor site on the north coast of the Gulf of Paria, in conformity with its contract with the Venezuelan Government made last December. Much dredging must be done to permit docking of vessels of 26,000 tons. Work on the railway from the Orinoco port of Palua to the mines at El Pao is proceeding under difficulties.

★Oliver Iron Mining Co., U. S. Steel subsidiary, has applied for concessions to the old Piacoa iron ore deposit. Several parties are in the field doing topographical and geological work, and a diamond drill campaign is to begin soon.

PERU

Foreign currency blocked—Copper ore sought at Chilete—Asphalt mines may be reopened

★Ore deposits at Chilete, about 60 miles inland from Pacasmayo, 400 miles north of Lima, are being resampled by the owners, Northern Peru Mining & Smelting Co., which purchased the mines from the Malaga interests in 1927. Ore reserves are estimated at about 500,000 tons containing copper, lead, zinc, and silver. If sampling justifies it, a differential-flotation mill will be erected of 200 tons capacity.

★Castrovyrreina Metal Mines Co., which operates a group of silver mines in the Department of Huancavelica, has recently cut an important orebody in the Santa Ines mine, where a small flotation plant is ready for use whenever needed.

★Several U. S. mining companies are reported to be interested in the Cailloma mines, belonging to Cia. Minera Cailloma, and situated about 100 miles northeast of Arequipa. The orebodies contain gold, silver, copper, lead, and zinc, and have been worked at various times since Spanish colonial days.

★A Government decree, issued early in July, blocked all foreign currency deposited in Peruvian banks, forcing the depositors to sell to the Government at the official rate of 6.50 soles to the U. S. dollar. Furthermore, the decree forbids export of gold, which can be sold, and must be sold, only to the Government at the official rate of $35 per ounce. Hoarding gold is prohibited, and mining companies formerly exporting gold must now sell it to the Government.

CHILE

Chuqui strike ends—Estimates for new steel plant—Miner to get more for silver

Caja de Credito Minero has fixed the value of the silver bars it sells to the jewelery trade at 1,200 pesos per kilogram, which is practically $1.29 per ounce. The previous price was 1,000 pesos per kilogram or about $1 per ounce. The price increase will go wholly to the miners who sell their ores to the Caja's cyanide plants for treatment.

★After a 31-day strike against Chile Copper Co., employees resumed work after the personal intervention of the vice president of the Republic. Terms of the final settlement included a wage increase of 8 pesos a day, increased food rations to be bought at reduced prices from company stores, and adjustment of severance pay given a worker who is fired or retires voluntarily. It has been calculated that the wage increase and the other benefits bring the average wage at the mine to about $6.50 per day. The strike cost the company about 20,000 tons of copper, and the country a month's taxes and wages.

★Caja de Credito Minero increased its ore-buying schedules, effective July 25, with new rates as follows: treatment of gold ores, 2 pesos per gram (about $2 per ounce); melting gold, 1 peso per gram; copper ores, 1½c. U. S. per pound of copper contained. Under this price increase, the new schedule for copper ores will be: for 10 percent ore, $17.40 per metric ton, with scale up and down of $2.97 per unit.

★The Mining Society of Chile, with which are affiliated all the mining companies and local mining societies and mining men, recently elected officers and council members for the coming three-year period. Senator Videla Lira was re-elected president of the society for a fourth term, and Messrs. Fernando Benitez and Arturo Herrera were elected first and second vice presidents, respectively. One of the first activities of the newly elected officers was to present to Sr. Hidalgo, Minister of Economy, a plan to help small mining operations through the present crisis of inflation.

BRAZIL

Mining men to meet in Rio—New tin and tungsten field being developed—Sulphide belt active

★Organized by the Brazilian chapter of the Instituto Panamericano de Ingenieria de Minas y Geologia (IPIMIGEO), which has its head-

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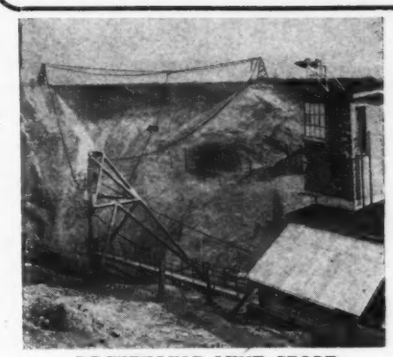

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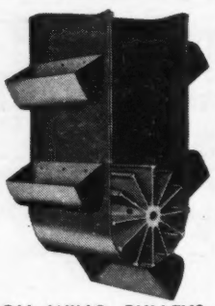

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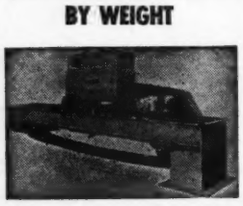

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BULLETIN 551

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Brazil *(Continued)*

quarters at Santiago, Chile, the Second Pan-American Congress of Mining and Geology will meet in Rio de Janeiro on October 6. In addition to the presentation of various papers, several trips will be made to visit the many mining and metallurgical enterprises in Brazil. Further details on the Congress appear on page 69 of this issue.

★Wolframite and cassiterite, associated with copper sulphides, were discovered last summer at Arado, Sorocaba County, State of Sao Paulo, by Alvaro Jurema, a prospector for the Institute of Geography and Geology of Sao Paulo. Several parallel veins containing tin and tungsten were found in the Salto de Itu granite of the Algonkian Sao Roque series. The veins strike east-west and dip almost vertically. Active prospecting is being carried on under the direction of Theodore Knecht, Sao Paulo geologist.

★Although mining activity has decreased recently in the sulphide belt of the Ribeira de Iguape, which comprises about 20,000 sq.km. in southeastern Sao Paulo and northeastern Parana, extensions of the mineralized faulted zones have been reported. The district is primarily a lead-silver belt, with some gold and copper veins. Gold has been produced since the sixteenth century. Production dropped at the time of the big gold rush to central Minas Gerais, and the district is recovering only slowly. Two lead smelters have been built, at Apiai and Panelas; a copper orebody is being prospected near Itapeva. At Ribeirao do Rocha, in Parana, several lead-zinc-copper veins have been discovered and at least 80 tons of 40 to 60 per cent lead ore has been mined. This property is being prospected by a party under Mario de Aguiar Abreu. Promising new extensions of the Lageado veins have been traced at the Santana property in Sao Paulo, and high grade silver-lead ore has been found. The property is owned by Osvaldo de Salles Sampaio.

AFRICA

Native miners strike for quadruple wages—Eight mines closed —Police break strike

★Labor unrest, prevalent in many quarters of the world, spread early in August to the gold mines of the Rand, where a striking group of the native miners succeeded in stopping production at eight mines for nearly a week. The eight mines totally affected were: Brakpan, City Deep, Marievale, Modder B, Nourse, Van Dyk, Van Ryn Gold, and Vlakfontein. At Rose Deep, a walk-out was averted by direct appeals of mine officials. Full details are not yet available, but the strike was apparently broken by Government action. Reports emanating from the Rand allege that Communist elements were to blame for arousing the Negro workers, numbering about 300,000 in all, to demand a daily wage of $2 among other benefits. Present wage for native workers is $0.50. Not all the natives were involved in the strike, however, and it is estimated that those actually striking at any one time never exceeded 50,000 men. Six workers were killed, several hundred were injured, and ten policemen were injured during a riot on Aug. 13, when police escorted strikebreakers into one of the mines through a mob of 1,500 workers.

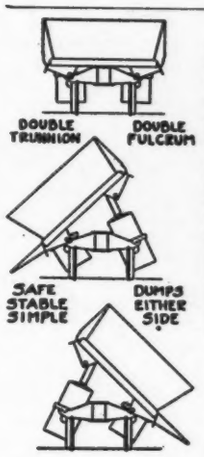
★The directors of Union Minière du Haut-Katanga predicted at the recent annual meeting of the company a considerable decline in copper output for the rest of 1946 from the rate of 13,000 tons per month reached earlier this year. A lack of hydro-electric power is forcing the curtailment. It is hoped to produce 140,000 tons in 1946, against 160,200 tons in 1945. The company regards the copper market picture as favorable and is no longer worried about the considerable stocks it has accumulated. Cobalt output last year was 3,000 tons; tin held at about 1,000 tons, although Katanga's deposits are nearing exhaustion. Radium production, about 80 grams per year, during the war is now a byproduct of the company's output of uranium, about which little was said.

★Welgedacht gold mine, which suspended operations in December 1939, is being reopened and a milling plant erected which will have a capacity of 25,000 tons per month. When this former Rand producer closed down, ore reserves were estimated at 489,000 tons valued at 4.45 dwt. over an estimated stoping width of 37.6 in. Development footage on reef totaled 52,010 ft., of which 10,090 ft. was payable at 10.6 dwt. over 17.4 in.

★Low-grade nickel deposits are reported discovered at Sibeswa, in the Western Province of Tanganyika. The find is about 30 miles from Mpanda, where a lead orebody is under exploration. C. Mason Farnum, a Falconbridge engineer, is reported on his way from Ontario to Tanganyika.

★Costs of operation of Transvaal mines were up and profits were down during the first half of 1946. Total working costs for the industry were £35,713,655, compared with £34,018,087 in the same period last year. Working costs per ton milled were 25s.5d., against 23s.2d. last year; working costs per ounce rose by 10s.6d to 125s.11d. Working profits were £13,405,456, compared with £15,916,817 last year. Other figures were:

	First Half 1946	First Half 1945
Tons milled.	28,139,300	29,363,800
Yield, oz.	5,903,210	6,115,726
Dwt. per ton.	4.033	4.015
Working revenue.	£49,119,111	£51,026,938
Dividends declared.	£6,173,419	£6,121,008



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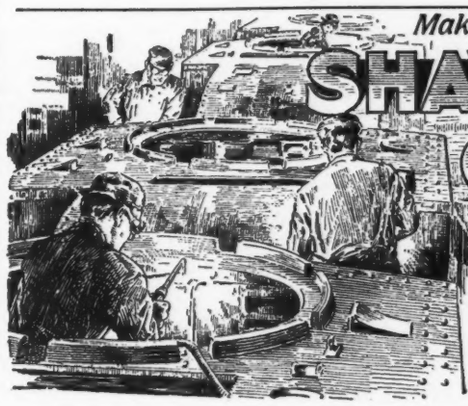
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AUSTRALIA

Mining council formed by Federal Government—Tableland Tin gets new dredge—New Mt. Lyell mine

★ A Commonwealth Mining Council has been formed by the Federal Government to review mining policy and to consider problems of national importance, such as stimulation of the mining industry, export-import problems, and taxation. An intermediate body, between the new council and the State departments of mines, is the Commonwealth Bureau of Mineral Resources, Geology, and Geophysics, the five sections of which deal with geology, geophysics, mineral economics, mining engineering, and petroleum technology. The supreme authority, the new Mining Council, will comprise the Federal Minister for Supply and Shipping and the State Ministers for Mines.

General opinion is divided as to the ultimate usefulness of the new body. It is considered, however, that its immediate attention might be directed to company taxation as it affects mining enterprises, including the gold tax. The most urgent phase of the question is the taxation of base-metal mining companies, which is so heavy as to retard exploration and development, although these companies have suffered through inability to carry on development and stope preparation during the war, and are now endeavoring to rebuild depleted ore reserves.

NEW SOUTH WALES

★New Occidental Gold Mines, N. L., at Cobar, is the largest gold mine in the State and was forced by wartime conditions to suspend mining in order to overtake arrears of development and preparation. During the past year it was possible to carry out 1,435 ft. of development work, including the sinking of the main shaft to 2,015 ft. from surface. Ore reserves are estimated at 299,281 tons of positive ore and ore broken in stopes, and 265,403 tons of probable ore to the 1,820-ft. horizon, making a total of 564,684 tons with an average assay value of 7.9 dwt. gold per ton. The orebody has an average width of 60 ft. and is worked by shrinkage stoping. Sublevel stoping has proved successful, and a mass blast recently gave the following results:

Tons ore broken.....	11,600
Tons broken per ft. of borehole	5.95
Tons broken per lb. of explosive	3.7
Lb. of explosive per ft. of borehole	1.58

The ore is hard and quartzitic. Treatment operations have recently been resumed and will be maintained at 8,000 tons per four weeks. The following milling results were reported:

Tons ore milled	16,760
Average head value: dwt per ton	8.108
Average residue value: dwt. per ton.....	0.820
Gold recovered: oz.....	6,114
Percentage recovery....	89.89

The company's adjoining mine, the New Cobar, contains copper, and the ore is treated by flotation in a section of the mill situated on the New Occidental property. During the period, 54,550 tons of ore was milled, having an average assay value of Au, 6.052 dwt. and Cu, 1.587 percent. Recoveries were 79.643 percent gold and 98.108 percent copper. Ore reserves are estimated at 84,100 tons. Remant ore is to be recovered by blast-hole drilling.

QUEENSLAND

Tableland Tin Dredging, N. L., at Mt. Garnet, is the largest producer of tin oxide in the Commonwealth. The dredge output of concentrate approximates 90 to 110 tons monthly from the treatment of 350,000 to 400,000 cu.yd. of alluvium. The plant was erected during the war. The property, as bored, contained 40,000,000 cu.yd. with an average value of 0.6 lb. tin oxide per cubic yard; 25,000,000 cu.yd. worth 0.5 lb., and 8,000,000 cu.yd. worth 0.37 lb. per cubic yard. Dimensions of the pontoon are: length, 166 ft.; width, 168 ft.; minimum freeboard is 30 in. The bucket ladder is 138-ft. centers, and the bucket line contains 92 16-cu.ft. manganese steel buckets with renewable lips. Digging rate is 24 buckets per minute. The ladder is fitted with 17 rollers of 17 in. diameter that are lubricated along with the lower tumbler bearing by a special greasing system operated from the deck when the dredge is in operation. Digging depth is to 60 ft. below water level in addition to a bank of 20 ft. Extreme angle of the ladder is 50 deg. The main drive is by two 200-hp. motors through totally inclosed 23.5 to 1 reduction gear. The ladder hoist winch is powered by a 175-hp. motor, and the mooring winch is driven by a 50-hp. dc. motor with Ward Leonard speed control. Drum clutches and brakes are operated by Westinghouse-type air equipment.

TASMANIA

Mt. Lyell Mining & Railway Co., Ltd., at Queenstown, is proceeding with plans for the working by open cut of 34,000,000 tons of copper ore assaying 0.7 percent Cu, at the rate of 5,000 tons per day. Preparations include additions to the mechanical loading and surface transport equipment and new and larger milling units. The company has just passed the fiftieth year since the start of copper production on June 25, 1896. The total tonnage of ore mined and treated since that date is 24,000,000

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Australia *(Continued)*

tons, total fluxes being 1,250,000 tons. Coke used totals 500,000 tons.

NEW GUINEA

★Operations are proceeding at the property of Bulolo Gold Dredging, Ltd., and progress is being made in reconditioning the plant which was either destroyed or damaged during the war. The eight dredges are more or less intact and offer minor problems in repair. The power house, however, was completely destroyed, and it was necessary to obtain new hydroelectric equipment. Some of this plant has been received and a great part has been shipped from the makers. By the end of the year the company should be approaching a resumption of dredging. Other mining properties have been examined and the damage has been assessed. Plans are being formulated for renewals and re-equipment, but in some properties much time must elapse before the productive stage is reached.

CIO Mine Union Policies

(*Continued from page* 82)

Europe to play power politics with the hunger and suffering of battle-fatigued peoples."

In regard to wages, the statement holds that the recent 18½c. wage increase given generally in the industry has been largely wiped out by rising costs of living and that future wage demands must offset this loss. In addition, sufficient wage increases must be demanded to raise living standards of union members above wartime levels. Associated demands will include liberalized vacations and overtime payments, health and welfare funds financed by employers, and elimination of geographic differentials. In the event of "another wave of mass unemployment," the union will seek a 30-hour work week with no reduction in take-home pay. The union scoffs at the "false" argument that higher wages mean higher living costs with the words, "Let the employers worry about their profits and their costs; they have always been too well able to protect their own standard of living at the expense of that of the workers."

In order to strengthen the union's bargaining position, a single industry-wide contract termination date will be sought, as it has been in the past. This date will be March 1 for the casting division of the union, and June 30 in the basic mining, smelting, and refining division. The so-called company-security clauses are opposed, as is any provision "for reprisals against workers imposed for any reason whatever." Through a coordinated system of committees, strike action hereafter will be taken in accordance with a nation-wide master plan, which will be fitted in as far as possible with the main CIO strike strategy.

More political action is called for, but because of "the bankruptcy of both the Democratic and Republican parties," a third party is called for, to be activated as soon as mass support can be gained from "labor, the farmer, and all the common people." Continued mineral subsidies are demanded, and the possibility of an end to the subsidy system leads to a suggestion that the union seriously consider "its advocacy of nationalization of the non-ferrous metals industry as the only sensible approach to conservation of our mineral resources and protection of the welfare of workers."

Plans for extension of union membership include organizing drives in the chemical industry, the South, eastern Canada, and various non-union mines such as the "gold mines of California and South Dakota." The statement concluded on this point with, "We should devote attention to organizing large numbers of white-collar workers and working foremen employed by companies for whose production and maintenance employees we already bargain."

A large section of the statement was devoted to "rank-and-file democracy," and a great point was made of the fact that membership and office-holding in the union must not be affected by "membership in any other organization" nor by "race, creed, color, sex, or political belief." This insistence on non-discrimination within the union is apparently aimed at forestalling any attempt to remove office holders, or to withhold membership, on the basis of affiliation with the Communist Party. Such anti-Communist drives have occurred recently in other CIO unions.

Broaden Activities

A stronger basis for union activity will be sought through an expanded program of union "education" reaching out to all locals however isolated. Special "educational" attention will be given to problems of various racial groups in the union, "Spanish-speaking workers, Negroes, French-Canadians, and others." The union newspaper will appear weekly and pamphleteering will be intensified if the program is adopted. Health and accident prevention were discussed, and aluminum therapy against silicosis was asked as a legislative matter. Old-age retirement funds, hospitalization plans, both employer-financed, and greater labor and government participation in safety activities were called for. A whole series of benefits to veterans, mostly involving cash payments from the Government, was advocated. Compulsory military training in peacetime was flatly opposed.

On foreign policy, the statement called for unity among the Allies, praised the United Nations as the workers' greatest hope for peace and security, and asked for "fearless" application of the principle of self-determination of peoples to countries such as China, Poland, and Greece.